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COGNITIVE ORIGINALITY, PHYSIOGNOMIC SENSITIVITY, AND DEFENSIVENESS IN CHILDREN, FINAL REPORT.

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THE EXAMINATION WAS CONDUCTED TO DETERMINE IF A CHILD'S ABILITY TO CREATE (COGNITIVE ORIGINALITY) IS INDEPENDENTLY ASSOCIATED WITH HIS GENERAL LEVEL OF INTELLIGENCE. ONCE THIS PROVED TO BE THE CASE THE INVESTIGATORS THEN PURSUED THE STUDY OF PSYCHOLOGICAL CORRELATES THAT DISTINGUISH INDIVIDUAL DIFFERENCES ON THE CREATIVITY AND INTELLIGENCE DIMENSIONS WHEN CONSIDERED JOINTLY. INSTRUMENTS, COVERING BOTH VERBAL AND VISUAL FORMATS, WERE DEVELOPED AND ADMINISTERED TO OVER 150 FIFTH-GRADE CHILDREN IN A GAME-LIKE CONTEXT WITHOUT TIME PRESSURE. THESE REQUIRED THE CHILDREN TO GENERATE VARIOUS KINDS OF ASSOCIATES WITH GIVEN TASK REQUIREMENTS. EACH CHILD DETERMINED USES FOR PARTICULAR OBJECTS, WAYS IN WHICH PARTICULAR OBJECTS WERE SIMILAR, AND THINGS THAT PARTICULAR PATTERNS REPRESENTED TO THEM. INTELLIGENCE INFORMATION WAS OBTAINED THROUGH THE USE OF A STANDARD TEST BATTERY. CORRELATIONS BETWEEN THE CREATIVITY AND INTELLIGENCE MEASURES WERE FOUND TO BE EXTREMELY LOW. THE SUBJECTS WERE THEN ISOLATED BY SEX INTO ONE OF FOUR GROUPS--(1) HIGH CREATIVITY-HIGH INTELLIGENCE, (2) HIGH CREATIVITY - LOW INTELLIGENCE, (3) LOW CREATIVITY - HIGH INTELLIGENCE, AND (4) LOW CREATIVITY - LOW INTELLIGENCE. DIFFERENCES AMONG THESE GROUPS WERE STUDIED IN FOUR AREAS OF COGNITIVE FUNCTIONING--(1) BEHAVIOR AS OBSERVED IN SCHOOL AND PLAY SETTINGS, (2) ACTIVITIES IN CATEGORIZING AND CONCEPTUALIZING, (3) SENSITIVITY TO PSYSIOGNOMIC PROPERTIES OF ENVIRONMENT, AND (4) PERSONALITY DISPOSITIONS, INDICATED THROUGH SELF-DESCRIPTION AND THROUGH FANTASY. ABUNDANT AND UNIQUE ASSOCIATIONS WERE FOUND TO EXIST. THE RESEARCH INDICATED THE IMPORTANCE OF STUDYING JOINTLY VARIATIONS IN CREATIVITY AND GENERAL INTELLIGENCE, IF UNDERSTANDING OF CREATIVITY IS TO BE FURTHERED. (JH)

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Final Report

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Cooperative Research Project No. 1316B

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TABLE OF CONTENTS

I. The Background of the Study and Theoretical Considerations . . . . p. 1

II. Measurement of and Relations between Creativity and Intelligence . p. 10

III. Observations in the School Environment . . . . p. 35

IV. Coding of Similarities and Differences . . . . p. 44

V. Physiognomic Sensitivity . . . . p. 69

VI. Personality Studied through Self-Description and Fantasy . . . . p. 88

VII. Abstract . . . . p. 113

References . . . . p. 121

Publications . . . . p. 126

Tables . . . . p. 127

Figures . . . . p. 208

I. THE BACKGROUND OF THE STUDY AND THEORETICAL CONSIDERATIONS

The present study is concerned with two modes of thinking in young children, which, it turns out, bear directly upon what has assumed the proportions of a controversy in recent psychological history. The nature of the controversy might be put somewhat as follows: Is there an aspect of cognitive functioning, which can be appropriately labeled "creativity," that stands apart from the traditional concept of general intelligence? A close appraisal of the quantitative findings available on this subject led us to a pessimistic answer. We shall pass examples of these findings in review. Our examination of this literature opened up to us, however, the possibility of a valid distinction between creativity and intelligence that had not, in our view, been sufficiently pursued and developed. The next step, therefore, was empirical research in terms of this distinction. Finally, if creativity and intelligence could be validly distinguished, we were interested in studying the possible psychological correlates that might distinguish individual differences on these two dimensions considered jointly. Specifically, we were concerned with correlates in such areas as the child's observed behavior in school and play settings, his aesthetic sensitivities, his categorizing and conceptualizing activities, his test anxiety and defensiveness levels.

We began with a simple question: Does the relevant psychological literature support the assumption of a unified dimension of individual differences describing more and less creative cognitive behavior? To put this question another way, can one demonstrate the existence of greater and lesser degrees of a cognitive capability that is like intelligence in regard to being a pervasive, broad dimension, but yet is independent of intelligence, and which can appropriately be labeled "creativity"? It is clear that to talk of "creativity" is to imply a referent different from that of the general intelligence concept. If that is not intended, then the creativity label becomes quite superfluous. The typical evidence that we found on this issue led, however, to an opposite conclusion. Let us consider an example.

The volume by Getzels and Jackson (1962), Creativity and Intelligence, is perhaps the best known of recent efforts in the field. Five alleged tests of creativity were administered to large samples of students ranging in class from sixth grade through the end of high school. Four of the five creativity tests correlated significantly with IQ for the girls, and all five of these tests correlated significantly with IQ for the boys. Consider next the relationships among the instruments in the creativity battery--that is, the question of whether they define a unitary dimension of individual differences. The Getzels-Jackson results showed that the five creativity tasks are virtually no more strongly correlated among themselves than they are correlated with intelligence. To give some averages, for boys the mean correlation is .26 between the creativity battery and IQ, and is .28 among the tasks in the creativity battery; in the case of the girls, the corresponding mean correlations are .27 and .32. In sum, the creativity measures correlated with intelligence on the order of .3, and also correlated with each other on the order of .3. There is no evidence, in short,for arguing that the creativity instruments are any more strongly related to one another than they are related to general intelligence. The inevitable conclusion is that little warrant exists here for talking about creativity and intelligence as if these terms refer to concepts at the same level of abstraction. The creativity indicators measure nothing in common that is distinct from general intelligence. Inspection of the creativity battery reveals a quite varied range of materials, including measures of the ability to devise mathematical problems, to compose endings for fables, to detect embedded geometric figures, to think up word definitions, and to imagine uses for an object.

Comparable examination of other research reports in the literature forced us to the same kind of conclusion. Our survey included the study of findings reported by Torrance and his co-workers (e.g., Torrance, 1960; 1962; Torrance & Gowan, 1963), Guilford and his collaborators (e.g., Guilford & Christensen, 1956; Wilson, Guilford, Christensen, & Lewis, 1954), Cline, Richards, and Needham (1963), Cline, Richards, and Abe (1962), Barron (1963), and Flescher (1963). To give one more example of the kind of outcome obtained, consider a recent study by Cline, Richards, and Needham (1963). With high school student subjects and seven creativity measures, the average correlation for boys between the creativity indexes and an IQ measure is .35, while it is .21 among the various creativity tests. For girls, the average correlation between the creativity tests and IQ is .33, while it is .24 among the seven creativity measures. Again and again in reviewing the research in this area, the evidence led to the conclusion that the various creativity measures utilized are almost as strongly, equally strongly, or even more strongly related to general intelligence than they are related to each other. The evidence in hand thus seemed not to permit the very type of conceptualization that Getzels and Jackson (1962) and other researchers were proposing: namely, that there exists a pervasive dimension of individual differences, appropriately labeled "creativity," that is quite distinct from general intelligence. This same critical point has been made by Thorndike (1963) in a recent article.

We were forced to conclude, therefore, that little of any generality was being measured here beyond differences in the traditional notion of intelligence. Let us pose two issues, however, that made it seem premature to let the matter go at that. First, a potpourri of abilities was being assessed in the good name of "creativity;" second, all of the work that we had seen failed to consider the implications of the social psychology of the assessment situation within which measurement of "creativity" was attempted. Consider each of these points in turn.

If we return to the introspections of highly creative artists and scientists, one major focus emerges. The majority of the available introspective accounts have in common a concern with associative freedom and uniqueness. These accounts consistently stress the ability to give birth to associative content that is abundant and original, yet relevant to the task at hand rather than bizarre. The writer's classical fear of "drying up" and never being able to produce another word, the composer's worry over not having another piece of music within him, the scientist's concern that he won't be able to think of another experiment to perform--these are but indications of how preoccupied creative individuals can become with the question of associative flow. Introspections about times of creative insight also seem to reflect a kind of task-centered, permissive, or playful set on the part of the person doing the associating. Einstein refers to "associative play" or "combinatory play." The person stands aside a bit as associative material is given freedom to reach the surface.

We would propose that the essentials of the creative process may be contained in the two elements just considered: first, the production of associative content that is abundant and that is unique; second, the presence in the associator of a playful, permissive task attitude. Given a task clear enough that bizarre associative products do not readily occur, and given a permissive context within which the person works, two variables should permit us to index individual differences in creativity: the number of associations that the person can generate in response to given tasks, and the relative uniqueness of the associations that he produces.

One implication of this view is that productivity and uniqueness of associates should be related variables. Defining uniqueness as a relative infrequency of a given associative response to the task at hand for a sample of subjects, we would expect stereotyped associates to come earlier and unique associates to come later in a sequence of responses. Such an expectation would also be consistent with recent work by Mednick (e.g., 1962). If unique associates tend to come later in time, then it becomes clear also that an appropriate assessment context will require freedom from the pressure of short time limits, and perhaps freedom from any temporal pressure at all. The postulated need for a permissive, playful attitude also implies the desirability of freedom from time pressure. Such temporal freedom is one aspect of what a permissive situation would involve. Permissiveness further connotes a relative lessening of evaluational pressures--that is, a focus upon the task rather than upon the self, a relaxed entertaining of the possible rather than tense insistence upon an answer that must be correct if one is not to lose face. The Taoists, as discussed by Rugg (1963), have called such a relaxed attitude a state of "letting things happen." Clearly we are describing a type of situation in which the individual does not feel that he is being tested, and hence does not feel that what he does will have a bearing upon his self-worth in the eyes of others. A hypothetical contrast between high and low creativity gradients of associative response strength is presented in the theoretical curves of Figure 1.

The foregoing analysis of creativity hence suggests a concentration of assessment attempts in the area of associational processes, in contrast to the quite heterogeneous types of tasks that have received the "creativity" label in studies of the kind touched upon earlier. This theoretical analysis also suggests that the assessment context must be quite different from the kind utilized in the studies that we have reviewed; there should be freedom from time pressure and there should be a playful, game-like context rather than one implying that the person is under test. Interestingly enough, the kind of context present in the case of _all_ of the studies on creativity to which we referred earlier has borne strong connotations that a test or examination is at issue; the creativity procedures invariably have been referred to as "tests," they have been administered to large groups of students in a classroom, and temporal constraint has been present--either explicitly, through the use of relatively brief time limits, or implicitly, through the use of group administration procedures. In all of this work, there has been the evident assumption that a testing context, with its implication that the respondent is being evaluated in terms of some success-failure criterion, is quite appropriate for studying creativity. The associative approach to creativity that we have taken, however, with its emphasis upon an attitude of playful entertaining of possibilities in a task-centered rather than ego-centered environment, suggests otherwise.

At this point we were ready to begin some experimentation of our own. Following the prescriptions just stated, could one empirically define a dimension of individual differences that concerned the ability to produce many cognitive associates, and many that are unique? Would this dimension possess a substantial degree of generality across differences in types of tasks? Finally, and most important, would this dimension be independent of individual differences in the traditional area of general intelligence? If research findings could provide affirmative answers to these questions, then, and only then, would one be in a position to talk about a kind of thinking ability appropriately labeled creativity, with the evident implication of a characteristic different from general intelligence, but yet a characteristic which also possesses a substantial degree of generality across task variations.

II. MEASUREMENT OF AND RELATIONSHIPS BETWEEN CREATIVITY AND INTELLIGENCE

In this section we describe the methods and results concerned with the questions of creativity assessment raised in the preceding pages. The description of sample that is provided applies also to all subsequent sections of this report.

Procedure

The Sample and the Setting

We chose to carry out our work with children in the fifth grade of elementary school, whose socio-economic status level placed them in the middle-class category. The fifth grade level was chosen on the ground that the general age of 10 or 11 was sufficiently advanced that the children possessed the requisite verbal skills for dealing with the instructional context in which our procedures had to be cast, but also was sufficiently early that the children had not yet entered adolescence with whatever special pressures might be attendant upon that period of development. We centered upon children of middle-class background, in turn, for the following reasons. It seemed necessary to concentrate on one general socio-economic stratum rather than bridging across strata, because differential opportunity and environmental stimulation might well impinge in many ways upon the various aspects of behavior under investigation (see, e.g., Miller & Swanson, 1960). From the perspective of the present study, such effects would be extraneous ones and hence had to be controlled. We could not adopt the solution of conducting parallel studies of middle and lower socio-economic status children, in turn, since our research questions demanded a large sample size for children of both sexes within a given social stratum. It simply was not feasible within the confines of one project to multiply by a factor of two the time and resources which our investigation required. Why, then, did we decide to work with children of middle rather than lower socio-economic status? First, because this is the general group which has been the target population in most of the relevant previous research. Second, because the "middle" class is coming to constitute an ever-increasing segment of this country's population, thus making it the one most relevant socio-cultural group for which to establish generalizations.

The children whom we studied were 151 in number: 70 boys and 81 girls. They comprised the entire fifth grade population of a suburban New England public school system. For the boys and girls respectively, the mean ages were 10 years, 8.17 months (S.D., 6.00 months), and 10 years, 7.10 months (S.D., 4.84 months).[1]

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[1] Age was measured to the nearest month as of the time work began with a given class.

The children in our sample came almost exclusively from families whose fathers have the following occupational roles: business manager, executive, sales representative, or accountant (51%); engineer, designer, or architect (17%); physician, dentist, or lawyer (15%); teacher, writer, or researcher (11%). The 6% not accounted for within these categories included such upper level blue collar occupations as electrician and carpenter. In sum, the families of our children largely reflect professional and managerial backgrounds. Their religious orientation is by and large Protestant, and all are white.

Approximately six or seven weeks were required in order to carry out our research with each class of about 25 children. The administration of all procedures was conducted by two women in their early twenties. Prior to beginning work on the project as a whole, and once again prior to starting work with each particular class, extensive efforts were made to convey to the teachers and principals the viewpoint that the present research effort did not concern the administration of tests or examinations. We deemed it essential to convince the teachers and principals of this matter before attempting to construct a game-like and relaxed interactional context with the children, since it was evident that the tenor of the casual references made by teachers and principals within hearing of the children could do much to facilitate or hinder our efforts to dissociate the present endeavor from the stressful sphere of evaluative testing. In the sequence of research with a given class, the experimenters would be introduced to the children as visitors interested in children's games.

During the first two weeks of the research sequence with a given class, the two experimenters functioned solely as observers, independently rating the children's behavior on the scales described in the next section. These weeks of observation incidentally served the function of permitting the children to become acquainted with the experimenters and familiar with their presence. Following this period of behavioral observation, the next four or five weeks were devoted to administering the various procedures that involved participation by the children. These included not only the instruments described in the present section,[2] but also the techniques that focused upon the other domains under study. Every effort was made to generate a permissive, game-like context in working with the children on most of the instruments comprising the study. There were several procedures where such an atmosphere could not prevail, however, and these were reserved for the end of the sequence of work with a given class.

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[2] The SCAT and STEP tests, described later in this section, were not administered by our experimenters but rather by the teachers as part of the school system's general testing program. These classroom test administrations took place at the start of the fifth grade year, prior to the beginning of our contact with the children.

In all, 17 procedures were administered to the children during the weeks that followed the observation period. All but one of these were administered individually, each experimenter working with about half the boys and half the girls in a given class. Administration of one procedure to the whole class was completed before work began on another. The two experimenters administered approximately equal numbers of procedures to a given child. The experimental sessions took place in two quiet and similarly decorated rooms.

The sequence of administration of the various instruments in our investigation was so arranged that the five techniques concerned with creativity fell first, fifth, sixth, ninth, and tenth in the sequence of seventeen. It will be noted later that two of these pertain to visual and three to verbal materials. The visual tasks fell at the fifth and tenth positions in the above ordering.

Instruments for Assessing Creativity

The procedures utilized for exploring creativity concerned the generation of five types of associates. In each case, our interest was in measuring two related variables: the number of unique responses produced by the child, and the total number of responses produced by the child. All procedures were described as games and were administered individually to each child under circumstances that were free from any time pressure. Further, these procedures did not require the child to respond in writing; rather all communication by the child was oral.[3]

Instances. This is the first of three verbal techniques. In it the child is asked to generate possible instances of a class concept that is specified in verbal terms. It is introduced with the following general instructions:

"In this game I am going to tell you something and it will be your job to name as many things as you can think of that are like what I tell you. For example, I might say 'things that hurt.' Now you name all the things you can think of that hurt." (The experimenter then lets the child try.) "Yes, those are fine. Some other kinds of things might be falling down, slapping, fire, bruises, or a knife." (Here the experimenter varies her suggestions so that they consist of ones which the child has not provided.) "So we see that there are all kinds of different answers in this game. Do you see how we play?" (If the child already indicates strong understanding, the last sentence is replaced by, "I can see that you already know how we play this game.") "Now remember, I will name something and you are supposed to name as many things as you can think of that are like what I've said. OK, let's go."

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[3] Some of the ideas represented in these procedures derive from the work of the Guilford group. That these particular instruments and their conditions of application nevertheless differ in many respects from the work of the Guilford group, will, however, soon be apparent.

The four items in this procedure, in their order of administration, are as follows:

(1) "Name all the round things you can think of."

(2) "Name all the things you can think of that will make a noise."

(3) "Name all the square things you can think of."

(4) "Name all the things you can think of that move on wheels."

Here and in the case of the other four creativity procedures, the following general considerations prevail.

The child is given as much time as he wishes for each item. That is, the experimenter exerts no pressure for speed on an item; rather, she encourages the child to continue working on a given question as long as he seems at all motivated to do so.

The variable of uniqueness is defined as follows: For each item in a procedure, a frequency distribution is constructed indicating the number of children in the total sample of 151 who give a particular response to that item. This analysis is carried out for every response provided to that item. Any response to a given item that is offered by only one out of the 151 children is defined as a unique response. The number of unique responses provided by a child in his answers to a particular item constitutes his uniqueness score for that item. A child's uniqueness score for a procedure as a whole consists of the sum of his uniqueness scores for the various items which constitute the procedure.

The variable of _number_ is defined as the total number of responses given by a child to a particular item. A child's number score for a procedure as a whole consists of his number scores for the various items making up that procedure.

Consider some examples of responses to the items of the _instances_ instrument. When asked to "name all the round things you can think of," we find that "life savers" is a unique response, while "buttons" is not; "mouse hole" is a unique response, while "plate" is not; "drops of water" is a unique response, while "door knob" is not. When posed the question, "Name all the things you can think of that will make a noise," we find that "dispose-all" is a unique response, while "a car honking" is not; "cash register" is a unique response, while "airplane" is not; "snoring" is a unique response, while "thunder" is not. When asked to "name all the things you can think of that move on wheels," we find that "tape recorder" is a unique response, while "wheelbarrow" is not; "clothesline" is a unique response, while "trolley car" is not.

Alternate uses. In this second of our three verbal techniques, the child is to generate possible uses for a verbally specified object. The task is introduced in the following manner:

"Now, in this game, I am going to name an object--any kind of object, like a light bulb or the floor--and it will be your job to tell me lots of different ways that the object could be used. Any object can be used in a lot of different ways. For example, think about string. What are some of the ways you can think of that you might use string?" (The experimenter lets the child try.) "Yes, those are fine. I was thinking that you could also use string to attach a fish hook, to jump rope, to sew with, to hang clothes on, and to pull shades." (The experimenter varies her suggestions so as not to duplicate any which the child has provided.) "There are lots more too, and yours were very good examples. I can see that you already understand how we play this game. So let's begin now. And remember, think of all the different ways you could use the object that I name. Here we go."

In this procedure it was apparent that all the children at the present age level understood on the basis of the above introductory remarks how the game was to be played. Hence, "I can see that you already understand how we play this game," always was said.

The eight items in the alternate uses instrument follow:

(1) "Tell me all the different ways you could use a newspaper."

(2) "Tell me all the different ways you could use a knife."

(3) "Tell me all the different ways you could use an automobile tire--either the tube or the outer part."

(4) "Tell me all the different ways you could use a cork."

(5) "Tell me all the different ways you could use a shoe."

(6) "Tell me all the different ways you could use a button--the kind that is used on clothing."

(7) "Tell me all the different ways you could use a key--the kind that is used in doors."

(8) "Tell me all the different ways you could use a chair."

As in the previous procedure, we measured the number of unique responses provided by a child to each item, and summed these results to obtain a uniqueness score for the instrument as a whole. We also measured the total number of responses that a child gave to each item, and summed these to yield the number of responses for the procedure as a whole.

Let us note some examples of responses obtained with the present instrument. When requested to "tell me all the different ways you could use a newspaper," "rip it up if angry" is a unique response, while "make paper hats" is not. When asked about uses for an automobile tire, "to grow tomato plants in" is a unique response, while "use inner tube for a life preserver" is not. When queried about uses for a shoe, "to trap a mouse in" is a unique response, while "to throw at a noisy cat" is not. For a button to be used as a "hatch on a model submarine" is a unique response, while for buttons to be used as "puppets' eyes" is not.

Similarities. In the present instrument, the child is to generate possible similarities between two verbally specified objects. The instructions were these:

"In this game I am going to name two objects, and I will want you to think of all the ways that these two objects are alike. I might name any two objects--like door and chair. But whatever I say, it will be your job to think of all the ways that the two objects are alike. For example, tell me all the ways that an apple and an orange are alike." (The child then responds.) "That's very good. You've already said a lot of the things I was thinking of. I guess you could also say that they are both round, and they are both sweet, they both have seeds, they both are fruits, they both have skins, they both grow on trees--things like that. Yours were fine, too." (The experimenter's suggestions are varied so as not to include any which the child has given.) "Do you see how we play the game?" (If the child indicates clear understanding already, the last sentence is replaced by, "I can see that you already know how to play this game.") "Well, let's begin now. And remember, each time I name two objects, you name as many ways as you can that these two objects are alike."

The similarities instrument comprised ten items as follows:

(1) "Tell me all the ways in which a potato and a carrot are alike."

(2) "Tell me all the ways in which a cat and a mouse are alike."

(3) "Tell me all the ways in which a train and a tractor are alike."

(4) "Tell me all the ways in which milk and meat are alike."

(5) "Tell me all the ways in which a grocery store and a restaurant are alike."

(6) "Tell me all the ways in which a violin and a piano are alike."

(7) "Tell me all the ways in which a radio and a telephone are alike."

(8) "Tell me all the ways in which a watch and a typewriter are alike."

(9) "Tell me all the ways in which a curtain and a rug are alike."

(10) "Tell me all the ways in which a desk and a table are alike."

The dependent variables of uniqueness and number were scored for each item in the manner already described, and were summed across items for the instrument as a whole.

As examples of responses to the items of the present procedure, consider the following. For "cat and mouse," "can make women scream" is a unique response, while "have tails" is not. For "milk and meat," "they are government-inspected" is a unique response, while "they come from animals" is not. Given "curtain and rug," "dogs get them dirty" is a unique answer, while "you have to clean them both" is not.

Pattern meanings. This is one of the two creativity assessment techniques involving visual rather than verbal stimulus materials. The procedure was introduced to the child as follows:

"Here's a game where you can really feel free to use your imagination. In this game I am going to show you some drawings. After looking at each one, I want you to tell me all the things you think each complete drawing could be. Here is an example--you can turn it any way you'd like to." (The experimenter gives the example card to the child. See Figure 2.) "What could this be?" (The child is encouraged to try some suggestions.) "Yes, those are fine. Some other kinds of things I was thinking of were the rising sun, a porcupine, eye lashes, a brush, a carnation, and probably there are lots of other things too. And yours were very good examples too." (The experimenter's particular suggestions are varied so as not to include any given by the child.) "I can see that you already know how we play this game. So let's begin now."

In the present procedure, then, the child is to generate possible meanings or interpretations for each of a number of abstract visual designs. The pattern meanings procedure consists of eight items, in addition to the example. Each drawing appears on a separate 4 in. x 6 in. card. The nine cards are illustrated in Figure 2. Each of the eight cards in the procedure proper is presented to the child with the instruction: "Here is another drawing. Tell me all the things you think this could be."

Once again, the dependent variables of uniqueness and number were scored for each item in the manner previously described, and were summed across the eight items for the procedure as a whole.

Among the responses to the pattern meanings procedure, consider these examples. For item 1, "lollipop bursting into pieces" is a unique response, while "flower" is not. For item 3, "foot and toes" is a unique suggestion, but "table with things on top" is not. In response to item 4, "two haystacks on a flying carpet" is a unique suggestion, while "two igloos" is not. For item 5, "five worms hanging" is a unique response, while "raindrops" is not. For item 7, "three mice eating a piece of cheese" is a unique response, while "three people sitting around a table" is not.

Line meanings. In our second creativity procedure involving visual stimulus materials, the child is confronted with one or another kind of line and is asked to generate meanings or interpretations relevant to the form of the line in question. The lines were adapted from Tagiuri (1960). Each line is a single continuous unit, in contrast to the discrete elements comprising the patterns in the preceding instrument. The line meanings technique is introduced to the child as follows:

"This game is called the line game. I am going to show you some lines and after you have looked at each one, I want you to tell me all the things it makes you think of. Now take your time, and be sure that when you look at the line you tell me what the whole line makes you think of, and not just a part of it. O.K.?"

The experimenter then presents the first of the nine items in this procedure. Each line is shown on a separate 4 in. x 6 in. card. See Figure 3 for a presentation of these stimulus materials. The experimenter now proceeds:

"Here is the first line. You can turn it any way you want to. Tell me all the things you can about it. What does it make you think of?"

After the child indicates that he has completed his suggestions for the first line, the subsequent items in the series are introduced with similar instructions. The variables of uniqueness of responses and number of responses were scored for each of the nine items in the manner previously described, and were summed across items to yield total scores for the whole procedure.

Consider the following examples of responses to the line meanings instrument. For item 1, "a squished piece of paper" is a unique response, while "mountains" is not. In the case of item 3, "squeezing paint out of a tube" is a unique response, but "a piece of string" is not. For item 4, "a stream of ants" is a unique response, while "a stick" is not. For item 6, "alligator's open mouth" is a unique response, while "arrowhead" is not; "private's stripe" is a unique response, but "hat" is not. In the case of item 9, "fishing rod bending with a fish" is a unique response, while "rising sun" is not; "airport hanger" is a unique response, but "top of head" is not.

Thus, in overview, we have described five creativity instruments, ranging across several different content areas. It should be stressed that the game-like instructional context did not eventuate in a flouting of the task constraints inherent in each experimental item. Bizarre or inappropriate responses were extremely rare. This is a matter of some consequence for the intrinsic validity of the number and uniqueness variables as indexes of creativity. If later associates in the response sequence--those most likely to be unique--were to take a bizarre turn, the relevance of our indexes for creativity could be seriously questioned. As the various illustrations of unique responses have shown, however, they are quite appropriate to the task requirements.

Of further concern is the general question of whether a response that is unique in the sample as a whole can be considered a creative product for the child who produced it. The answer to this question would obviously require the kind of detailed clinical and biographical study of each child that is impossible to carry out in practice. On the other hand, we propose that, in a sample of 151 children of fairly homogeneous socio-economic background, a unique response which is at the same time appropriate to task demands will have considerable relevance for the associational conception of creativity outlined in section 1.

If one accepts the conception outlined in Figure 1--unique associates emerging later in the associational sequence--then we can proceed to examine the actual magnitude of relations between quantity and uniqueness of associates. Strong positive correlations would empirically strengthen the model portrayed in Figure 1, and thereby would increase our confidence in the relevance of the uniqueness index. Empirical relationships do in fact assume that form, as evidence presented later in the section will show.

Instruments for Assessing General Intelligence

Our assessment techniques for measuring general intelligence were ten in number, and included the following materials: three subtests from the Wechsler Intelligence Scale for Children (WISC); the School and College Ability Tests (SCAT), which provide measures of verbal aptitude and quantitative aptitude; and the Sequential Tests of Educational Progress (STEP), which provide indexes of academic achievement in various substantive areas. Our inclusion of "scholastic achievement" indicators within the overall category of "general intelligence" reflected the fact that typical indicators of aptitude or intelligence, on the one hand, and of academic achievement, on the other, have been found to be rather strongly correlated (see, e.g., Cooperative Test Division, 1957c). We will note later that our results yield the same picture.

Subtests from the Wechsler Intelligence Scale for Children. One verbal and two performance subtests from the WISC were administered individually to each child. The verbal subtest was Vocabulary; the performance subtests were Picture Arrangement and Block Design. Administered in the order, Picture Arrangement, Vocabulary, and Block Design, these instruments were fourteenth through sixteenth in the sequence of 17 procedures given to each child. Selection of the Vocabulary subtest was based on the fact that it possesses a very high correlation with the total verbal scale score, and with the full scale score, of the WISC (Wechsler, 1949). In a similar fashion, the Block Design and Picture Arrangement subtests from the performance scale of the WISC were selected because of their high correlations with the total performance scale score and with the full scale score (Wechsler, 1949).

Administration and scoring for the Vocabulary, Block Design, and Picture Arrangement subtests followed the general procedures set down in the WISC manual (Wechsler, 1949). In the Vocabulary subtest, the child is asked to provide definitions for each of a number of words, arranged in a series of increasing difficulty. In the Block Design subtest, the child is to assemble blocks in such a manner that they look like a design presented to him on a card. A number of different designs are employed. In the case of the Picture Arrangement subtest, the child is requested to arrange a set of pictures in such a way as to "make a sensible story." This task involves a number of different picture sets.

The School and College Ability Tests. These are widely used group-administered tests for assessing the traditionally demarcated areas of verbal ability and quantitative ability. Prepared by the Cooperative Test Division of Educational Testing Service, the test materials are available in forms whose general levels of difficulty are appropriate to different amounts of schooling. The SCAT tests were administered by the school authorities at the beginning of the academic year to the six classes of fifth-graders. As we have noted, this test administration occurred prior to the start of our experimenters' contact with the children. Form 5A of SCAT was utilized. Administration and scoring proceeded in the manner described by the test publisher (see Cooperative Test Division, 1957a; 1957b).

A form of SCAT appropriate for administration at the beginning of the fifth-grade year provided the SCAT scores of verbal and quantitative ability for the present sample of children. The verbal ability score is based upon two kinds of items: sentence completions, which depend upon comprehension of the general meaning of a sentence, and synonyms, which test the child's vocabulary by requesting him to choose the closest synonym to a given word from among multiple-choice alternatives. The quantitative ability score also reflects the ability to deal with two types of items. In the first type, the child is asked to manipulate numbers and apply number concepts in carrying out computations. In the second type of item, the child has to solve problems involving quantities. (Cooperative Test Division, 1957a; 1957b)

The Sequential Tests of Educational Progress. Academic accomplishment in five content areas is evaluated in the tests that were administered to the present group of children: mathematics, science, social studies, reading, and writing. The Cooperative Test Division of Educational Testing Service publishes STEP, and the tests are available in several forms with degrees of difficulty corresponding to different schooling levels. As in the case of SCAT, the STEP tests are group administered and widely used. Our sample of fifth-graders received the STEP tests at the beginning of the fifth-grade year, as part of the same general testing program during which the SCAT tests were administered. Form 4A of STEP was used. Again, administration and scoring were carried out in the manner described by the test publisher (see Cooperative Test Division, 1957c; 1957d).

The five STEP areas that were studied include the following kinds of materials (Cooperative Test Division, 1959): The mathematics test measures mastery of such mathematical ideas as number, operation, and measurement. The science test assesses mainly the ability to suggest or eliminate hypotheses and the ability to select methods for the testing of hypotheses in different substantive fields of science. The social studies test focuses upon the ability to see relationships among facts, compare information , and draw conclusions, in the case of such fields as history and geography. The reading test concerns mastery of such reading skills as are involved in summarizing and interpreting passages, as well as in criticizing and evaluating passages with respect to purposes of presentation and motivation of authors. Finally, the writing test evaluates the child's judgment regarding such matters as grammar, punctuation, organization, and effectiveness of written presentations. The form of STEP used was one appropriate for administration at the beginning of the fifth-grade year.

In sum, our ten indexes of general intelligence covered verbal, visual and quantitative skills, and extended across a range of substantive content.

Results and Discussion

The ten creativity indicators--a uniqueness and a productivity measure for each of five procedures--prove to be highly reliable, in terms of both split-half and item-sum correlations. The findings are presented in Tables 1 through 6. The reliabilities of the ten intelligence instruments, in turn, are known to be quite high. We now are in a position, therefore, to study the dimensionality of the creativity and intelligence indexes. The findings are as follows. Whether examining results for the sample as a whole, or separately for the 70 boys and the 81 girls, the ten creativity measures prove to be highly intercorrelated, the ten intelligence measures prove to be highly intercorrelated, and the correlations between the creativity and the intelligence measures prove to be extremely low. To provide an idea of the correlational magnitudes involved, the average correlation among the ten creativity measures is on the order of .4; the average correlation among the ten intelligence indicators is on the order of .5; and the average correlation between these two sets of measures is about .1. The detailed findings are contained in Tables 7 through 16.

We may conclude, therefore, that a dimension of individual differences has been defined here which, on the one hand, possesses generality and pervasiveness, but which, on the other hand, nevertheless is quite independent of the traditional notion of general intelligence. This new dimension concerns a child's ability to generate unique and plentiful associates, in a generally task-appropriate manner, and in a relatively playful context. It is a considerable surprise that such a dimension should prove to be quite independent of general intelligence, and it seems indeed appropriate to label this dimension "creativity." The independence of this dimension from general intelligence seems all the more intriguing for two reasons: first, the creativity procedures almost inevitably call upon verbal facility in some degree, and verbal facility is a very basic element of the general intelligence concept; second, the independence in question is found for elementary school children, and one would expect young children to show less differentiation in modes of cognitive functioning than adults.

Means for the two sexes on the various creativity and intelligence measures are presented in Tables 17 and 18. These indicate that, on balance, the mean performances of the two sexes on the various creativity and intelligence indicators are relatively comparable.

Having isolated a mode of thinking in children that is pervasive, independent of intelligence, and appropriately described as a dimension of individual differences in "creativity," we now wish to understand its psychological significance. The appropriate research strategy at this point seems to require consideration of individual differences on the creativity and the intelligence dimensions taken jointly. That is, a child's location has to be defined with respect both to general intelligence and to creativity as we have conceived of it. It is necessary, in other words, to compose four groups of children within each sex: those high in both creativity and intelligence, those high in one and low in the other, and those low in both.

In order to define these groups, a single creativity index score and a single intelligence score are obtained for each child. These index scores are the summed standard scores of the ten measures in each respective domain. The distributions of creativity index scores and of intelligence index scores then are dichotomized at their respective medians, within sex, to yield the groups that exemplify the four possible combinations of creativity and intelligence levels. The two sexes, incidentally, are quite similar with regard to the distribution of these index scores. Table 19 indicates this point. Since all cases are retained, rather than just the extremes, it is evident that the procedure used for composing creativity and intelligence combinations is a conservative one. Tables 20 and 21 indicate the resultant groupings. The sample sizes contained in these tables apply for all subsequent two-by-two analyses of variance in which creativity and intelligence constitute the treatment variables. In these and in all other analyses of variance, standard deviations appear in parentheses below the means for the various groups. Snedecor's (1946) Method of Unweighted Means has been used throughout for computing analyses of variance.

Comparability of the various creativity and intelligence groupings for each sex in regard to age is indicated in Tables 22 and 23.

In the sections of this report which follow, we turn to a consideration of various psychological differences that were found to distinguish children who are both creative and intelligent, creative but not intelligent, intelligent but not creative, and neither creative nor intelligent. The next section will deal with behavior in the school environment. Section IV then will turn to a consideration of categorizing and conceptualizing activities. In section V will be found studies concerned with sensitivity to physiognomic properties of visual stimuli. Section VI presents research on personality as examined through self-description and fantasy. Section VII, finally, contains an abstract of this report.

III. OBSERVATIONS IN THE SCHOOL ENVIRONMENT

The purpose of the present endeavor was to explore possible relationships between the creativity and intelligence groupings, on the one hand, and observable behavior in school and play situations, on the other.

Procedure

Our intent in the construction of rating scales was to exhaust the repertoire of behaviors observable in the school environment from which the subjects were drawn. On the basis of pretest work which indicated their feasibility, the following nine rating scales were defined:

A. To what degree does this child seek attention in unsocialized ways, as evidenced by such behavior as speaking out of turn, continually raising his hand, or making unnecessary noises?

1 ___	2 ___	3 ___	4 ___	5 ___	6 ___	7 ___	8 ___	9 ___
never		seldom		sometimes		usually		always

B. To what degree does this child hesitate to express opinions, as evidenced by extreme caution, failure to contribute, or a subdued manner in a speaking situation?

1 ___	2 ___	3 ___	4 ___	5 ___	6 ___	7 ___	8 ___	9 ___
never		seldom		sometimes		usually		always

C. To what degree does this child show confidence and assurance in his actions toward his teachers and classmates, as indicated by such behavior as not being upset by criticism, or not being disturbed by rebuffs from classmates?

1 ______ 2 ______ 3 ______ 4 ______ 5 ______ 6 ______ 7 ______ 8 ______ 9 ______

never seldom sometimes usually always

D. To what degree is this child's companionship sought for by his peers?

1 ______ 2 ______ 3 ______ 4 ______ 5 ______ 6 ______ 7 ______ 8 ______ 9 ______

never seldom sometimes usually always

E. To what degree does this child seek the companionship of his peers?

1 ______ 2 ______ 3 ______ 4 ______ 5 ______ 6 ______ 7 ______ 8 ______ 9 ______

never seldom sometimes usually always

F. To what degree does this child deprecate his work and himself, as indicated by such behavior as refusing to show or discuss the work he has done, or making deprecating statements about himself or his work?

1 ______ 2 ______ 3 ______ 4 ______ 5 ______ 6 ______ 7 ______ 8 ______ 9 ______

never seldom sometimes usually always

G. To what degree do this child's actions seem to be inhibited by the formal classroom learning situation, as compared with behavior during recess, gym, or other free time?

1 ____	2 ____	3 ____	4 ____	5 ____	6 ____	7 ____	8 ____	9 ____
never		seldom		sometimes		usually		always

H. How would you rate this child's attention span and degree of concentration for academic school work?

1 ____	2 ____	3 ____	4 ____	5 ____	6 ____	7 ____	8 ____	9 ____
poor		below average		average		good		superior

I. How would you rate this child's interest in academic school work, as indicated by such behavior as looking forward to new kinds of academic work, or trying to delve more deeply into such work?

1 ____	2 ____	3 ____	4 ____	5 ____	6 ____	7 ____	8 ____	9 ____
poor		below average		average		good		superior

Two female judges were employed, each making her ratings independently. In the case of a given class, the judges were instructed to rank order the subjects along each dimension, and then to apply the nine-point scale to the ordering. The points on the scale were to be conceived as absolutes. The actual ratings of the children in a particular class followed two weeks of observation in the classroom and in the school environment as a whole. It should be stressed that *the two-week observation period preceded the administration of all of the study's experimental procedures.* Hence, the ratings of the children's behavior were in no way contaminated by knowledge of the children's performance on the various tasks included in the study. Furthermore, the subjects' scores on the aptitude and achievement tests which had been administered by the school authorities at the beginning of the academic year (SCAT and STEP) were not made available to the raters. Finally, communication between the raters and teachers was held to the minimum necessary to facilitate the study. The teachers were informed that they were not to talk to the judges about individual pupils.

The use of two independent judges to observe and rate the children's behavior permits a check on rating reliability. Reliability data are reported in Table 24. Shown for each dimension are the intraclass correlation coefficients and the frequency distributions for each rating variable of the number of cases at each degree of discrepancy. With the exception of Dimension G, the intraclass correlation coefficients reach fairly satisfactory levels. Note further that the modal discrepancy between judges (with the exception of Dimension G) is either zero or one unit on a nine-point scale.

Having demonstrated acceptable levels of reliability for our rating dimensions, the ratings of the two independent judges were averaged in our subsequent work with each dimension. Given the very low level of agreement between the judges on Dimension G, we shall omit it from further consideration in subsequent analyses of the data.

Results and Discussion

In Table 25, we find the means and standard deviations for each rating dimension by sex. Sex differences occur for only two dimensions, and these differences are consistent with general expectations. Table 26, in turn, presents the interrelationships among the rating dimensions for each sex separately. While there are significant r's, the results do not suggest that the ratings coalesce into a single general factor. Turning to relationships between the creativity-intelligence groupings and the behavior ratings, the major findings of statistical significance are presented in Tables 27 through 38. For the boys, behavior ratings are found to be associated almost exclusively with the intelligence dimension. While similar relationships between intelligence and behavior ratings also are found for the girls, in their case we further note the presence of relationships between creativity and behavior ratings, as well as interactions between intelligence and creativity in their relationships with the behavior ratings.

Let us look in some detail at the results for the girls. Those high in both creativity and intelligence show the least doubt and hesitation of all the groups, show the highest level of self-confidence, and display the least tendency toward deprecation of oneself and one's work. Concerning companionship, these girls are sought out by their peers more eagerly than is any other group, and this high intelligence-high creativity group also seeks the companionship of others more actively than does any other group. There is reciprocity in social relationships for the members of this group. With regard to achievement, this group shows the highest levels of attention span, concentration, and interest in academic work. In all of these respects, the high-high group obviously is reflecting highly desirable modes of conduct in both the social and the achievement spheres. Interestingly enough, however, this group also is high in regard to disruptive, attention-seeking behavior. The high-high children may well be brimming over with eagerness to propose novel, divergent possibilities in the classroom, in the face of boredom with the customary classroom routines. Against the context of classroom programs that emphasize equal participation by class members and academic values that are likely to center around the traditional intelligence dimension, the cognitive behavior reflected in high creativity levels in the case of these girls may well possess a nuisance value and exert a rather disruptive effect in the classroom situation.

Consider next the group high in creativity but low in intelligence. In many respects it turns out that this group is at the greatest disadvantage of all in the classroom--and, indeed, under more of a disadvantage than the group which is low in both creativity and intelligence. Those of high creativity but low intelligence are the most cautious and hesitant of all the groups, the least confident and least self-assured, the least sought after by their peers as companions, and in addition, are quite avoidant themselves of the companionship of others. There is a mutuality of social avoidance in the case of these girls. In the academic sphere, they are the most deprecatory of their own work and the least able to concentrate and maintain attention. In terms of the ratings for disruptive attention-seeking, however, these girls are high, and in this one respect similar to the high creativity-high intelligence group. Most likely, however, the attention-seeking of these two groups is quite different in quality, given the highly different contexts of other behaviors in the two cases. While the disruptive behaviors of the high-high group suggest enthusiasm and overeagerness, those of the high creative-low intelligent group suggest an incoherent protest against their plight.

It affords an interesting comparison to turn next to the group low in both intelligence and creativity. These girls actually seem to be better off than their high creativity-low intelligence peers. The low-low group possesses greater confidence and assurance, is less hesitant and subdued, and is considerably more outgoing toward peers in social relationships,than is the high creative-low intelligent group. The low-low group members appear to compensate for their poor academic performances by activity in the social sphere, while the high creative-low intelligent individuals, possessing seemingly more delicate sensitivities, are more likely to cope with academic failure by social withdrawal and a retreat within themselves.

Finally, we turn to the group high in intelligence but low in creativity. As in the case of the high-high group, these girls show confidence and assurance. In terms of companionship patterns, however, an intriguing difference emerges. While sought quite strongly as a companion by others, the girl in this group tends not to seek companionship herself. She also is least likely to seek attention in disruptive ways and is reasonably hesitant about expressing opinions. Attention span and concentration for academic matters, in turn, are quite high. The impression that emerges, then, is of a girl who is strongly oriented toward academic achievement, is somewhat cool and aloof in her social behavior but liked by others anyway, and is unwilling to take the chance of overextending or overcommiting herself; there is a holding back, a basic reserve.

These results indicate the importance of determining--at least in the case of the girls--whether creativity is present in the context of high or low intelligence, and whether intelligence is present in conjunction with high or low creativity. The relevance of this same general point for the boys as well as the girls will become evident in further sections of the present report. It seems to be necessary, in other words, to consider a child's joint standing on both the creativity and the intelligence dimensions. One must seriously question, therefore, the Getzels and Jackson (1962) procedure of defining a "high creative" group as children who are high in creativity but low in intelligence, and defining a "high intelligent" group as children who are high in intelligence but low in creativity. If one wishes to establish generalizations about the nature of creativity and of intelligence as distinct characteristics, one cannot afford to ignore those children who are high in both and who are low in both.

IV. CODING OF SIMILARITIES AND DIFFERENCES

In considering how the child deals with similarities and differences in his environment, a distinction can be drawn between categorization and conceptualization processes. By "categorizing" we shall refer to the range of discriminable events placed in a common category. Such a range may be broader or narrower. A further distinction can be made between two types of categorizing breadth. In one type, the category is clearly specified by someone else, and we are assessing the subject's preferred "band-width" for a given category. In the other type, the subject himself must determine the nature of the category as well as its breadth by sorting a heterogeneous array of objects into groupings whose members he considers equivalent in one or more respects. We are determining the subject's preferred "equivalence range " in the construction of categories. By "conceptualizing," in turn, we shall refer to the structural properties and content of the concepts which a person formulates. Conceptualizing can be studied, of course, only in those cases where the subject forms his own concepts rather than having them provided by the experimenter. Thus, while conceptualizing can be studied in the case of object-sorting behavior, it cannot be studied in the case of band-width behavior.

Besides distinguishing between categorizing and conceptualizing, and between band-width and equivalence-range procedures in the study of categorizing, there is a further relevant distinction concerning equivalence-range procedures as such. When a subject sorts objects into what he construes to be equivalence groupings, there may be a psychological difference between those cases where groups of two or more objects are established and those cases where objects are left ungrouped. To determine whether or not this possible difference has empirical consequences, we shall score the two types of groupings separately. The former shall be described as yielding a measure of "conceptual differentiation," the latter, as yielding a measure of "compartmentalization."

In the study of conceptualizing, a particular interest was to consider the child's tendency to thematize--to construct concepts involving relations among elements--in contrast to forming concepts that involve abstraction. In abstraction, the subject seeks to detect common aspects present in the elements; on the other hand, in thematizing, the subject seeks to place the elements in a functional relationship to each other. Thematizing, furthermore, can proceed within an instructional context that is encouraging of abstraction, or within an instructional context that explicitly requires the subject to engage in thematic responding if he is to cope adequately with the task. The first type of context permits study of a preference for thematizing; the second type permits us to assess the ability to thematize. Both types will be explored in the work reported below: the first type, through studying reasons given for groupings in an object-sorting task; the second type, through exploring the child's ability to integrate words into a story theme.

Procedure

Measures of Breadth of Categorization

Band-width procedure. Used as an index of the "band-width" type of category breadth was the Wallach and Caron (1959) adaptation for children of the Pettigrew (1958) category width test. The present instrument was the eleventh in the sequence of procedures, and was administered in the classroom to the children in aggregate. The experimenters attempted to maintain a game-like atmosphere for the administration of the category width task. Thus, the instrument was described as a "guessing game" to the children. Since all of the subjects had experienced considerable individual contact with the experimenters in a relatively relaxed context before the category width task was given, the precautions taken should have served to minimize the apprehensions of children for whom the category width task might otherwise have had a test-like character.

The experimenter read the instructions for the "guessing game" to the children, as follows (these instructions were also reproduced on the instrument): "This game asks you to guess about a lot of things in our world. For instance, if you knew that most grown-up men in the world are around 5 feet and 7 inches tall, you might guess that the tallest man in the world is 7 feet tall, or 8 feet tall. And you might guess that the shortest man in the world is 4 feet tall or only 3 feet tall.

In this game you get a chance to guess about things like that. Why don't you just begin reading now, and circle your guesses for each of the things printed below. Take your time, and ask me any questions you want about things that aren't clear to you."

Listed below are the 12 items comprising the children's version of the category width test.

1. Most birds fly at the speed of about 17 miles per hour.
    a. How fast does the fastest bird fly?
        1. 30 miles per hour
        2. 21 miles per hour
        3. 60 miles per hour
        4. 18 miles per hour
    b. How slow does the slowest bird fly?
        1. 15 miles per hour
        2. 5 miles per hour
        3. 10 miles per hour
        4. 2 miles per hour
2. Most whales are about 65 feet long.
    a. How long is the longest whale?
        1. 69 feet
        2. 150 feet
        3. 76 feet
        4. 90 feet

b. How short is the shortest whale?

1. 37 feet
2. 8 feet
3. 51 feet
4. 58 feet

3. Usually about 58 ships arrive in New York City harbor every day.

a. What do you guess is the largest number of ships ever to arrive in New York City harbor in one day?

1. 102 ships
2. 65 ships
3. 74 ships
4. 60 ships

b. What do you guess is the smallest number of ships ever to arrive in New York City harbor in one day?

1. 5 ships
2. 49 ships
3. 38 ships
4. 18 ships

4. Most dogs are about 3 1/2 feet long.

a. How long is the longest dog?

1. 4 1/2 feet
2. 4 feet
3. 5 1/2 feet
4. 6 1/2 feet

b. How short is the shortest dog?

1. 1 foot
2. 1/2 foot
3. 2 1/2 feet
4. 2 feet

5. Most cars are able to go about 90 miles per hour.

a. How fast will the fastest car go?

1. 213 miles per hour
2. 95 miles per hour
3. 394 miles per hour
4. 132 miles per hour

b. How slow will the slowest car go?

1. 3 miles per hour
2. 18 miles per hour
3. 9 miles per hour
4. 1/2 mile per hour

6. Most roads are about 18 feet wide.

a. How wide is the widest road?

1. 51 feet
2. 27 feet
3. 20 feet
4. 36 feet

b. How narrow is the narrowest road?

1. 16 feet
2. 7 feet
3. 2 feet
4. 11 feet

7. Most states have about 4 million people in them.

a. How many million people are there in the largest state?

1. 5 million
2. 15 million
3. 8 million
4. 30 million

b. How many million people are there in the smallest state?

1. 1 million
2. 2 million
3. 1/8 million
4. 3 million

8. Most buildings are about 50 feet high.

a. How high is the tallest building?

1. 421 feet
2. 1253 feet
3. 157 feet
4. 63 feet

b. How short is the shortest building?

1. 40 feet
2. 6 feet
3. 29 feet
4. 17 feet

9. Most windows are about 34 inches wide.

a. How wide is the widest window?

1. 110 inches
2. 36 inches
3. 43 inches
4. 57 inches

b. How narrow is the narrowest window?

1. 3 inches
2. 21 inches
3. 12 inches
4. 28 inches

10. Most sailboats go about 9 miles per hour.

a. How fast will the fastest sailboat go?

1. 22 miles per hour
2. 39 miles per hour
3. 11 miles per hour
4. 14 miles per hour

b. How slow will the slowest sailboat go?

1. 7 miles per hour
2. 8 1/2 miles per hour
3. 6 miles per hour
4. 4 1/2 miles per hour

11. Every year about 300 new schoolbooks are written.

a. What is the largest number of schoolbooks written in one year?

1. 524 books
2. 330 books
3. 392 books
4. 980 books

b. What is the smallest number of schoolbooks written in one year?

1. 94 books
2. 25 books
3. 9 books
4. 180 books

12. Most people spend about 55 minutes out of a whole day eating meals.

a. What is the longest time anyone spends eating meals in a whole day?

1. 60 minutes
2. 105 minutes
3. 240 minutes
4. 73 minutes

b. What is the shortest time anyone spends eating meals in a whole day?

1. 3 minutes
2. 29 minutes
3. 47 minutes
4. 11 minutes

In scoring the procedure, the two parts of each item are keyed 1, 2, 3, and 4, representing responses that are least to most discrepant from the central tendency provided for each item. These 24 values are simply summed to yield the total score. A large score reflects a preference for broad band widths; a small score reflects a preference for narrow band widths. The odd-even reliability coefficient for the present variable was .76 for the sample of 151 children.

Equivalence range procedure. The present procedure (described as a "picture game") was fourth in the experimental sequence. Fifty words referring to fifty familiar objects in the Clayton and Jackson (1961) Object Sorting Test were transformed into pictorial form. A line drawing of each of the fifty familiar objects appeared on a separate card.

The objects were as follows: a fork, a door, a tire, a scissors, a TV set, a spoon, a cigarette, a spool of thread, an arrow, a lamp, a flashlight, a flower, a clock, a lipstick, a rake,a jacket, a screwdriver, a wallet, a letter, a sled, a hanger, a refrigerator, a hammer, a pot, a key, a picture, a coin, a radio, a rowboat, a telephone, a canoe, a rug, a golf club, a comb, a shoe, a chair, a baseball, a cup, a pistol, a hat, a pencil, a lamppost, a purse, a candle, a ruler, a glass, a book, a watch, a tree, a stool.

Instructions to the subjects were the following: "Now let's play the picture game. While I spread these pictures out for you I'll name them off so that we will be sure to agree on what each object is." (The experimenter sets down 5 rows of 10 pictures each before the subject, naming each as it is put down. The same initial arrangement is used for every child.) "Now your job is to look the pictures over and then put all the pictures that seem to belong together into groups. The groups may be large or small, any size you want as long as the pictures in each group belong together for a reason. There aren't any right or wrong answers in this game. Every time I play it with someone the groups turn out differently. So you see, any way you feel like making groups is fine, as long as you have some reason for it. Once you make the groups you can add to them or change them, and if there are any pictures left over at the end that don't seem to fit into any of your groups, you can just leave them separately. Do you see how we play the game? -- Good. Now take your time, there's no need to hurry. And remember that your groups can be all different sizes. O.K., go ahead."

Subjects then proceeded to rearrange the cards to form groupings. When the subject completed the grouping task, the experimenter inquired into the reasons for the particular groupings formed. These will be discussed below.

Two measures are derived from the number of groupings provided. The number of groups containing two or more objects constitutes the conceptual differentiation score; the number of singles, i.e., objects left ungrouped, constitutes the compartmentalization score.

Turning to matters of reliability, an index of internal consistency obviously could not be obtained in the present case. Note should be taken, however, of the correlation of .75 between alternate forms of the object sorting test in the work of Sloane, Gorlow, and Jackson (1963). While these were group-administered paper-and-pencil versions for adults, correlations with the individually administered Gardner (1953) object sorting test were substantial. These various correlations concern number of groups including singles.

Measures of Conceptual Style

Reasons for object sortings. The categories proposed by Kagan, Moss, and Sigel (1960) were employed in scoring the reasons provided by a child for his object sortings. These categories--descriptive, inferential, and relational--were not devised for the particular object-sorting procedure used here, and hence it was necessary to amplify the Kagan, *et al.* scheme somewhat for scoring purposes.

The scoring rules for the descriptive category were as follows: "Groupings in this category are based on similarity in objective, physical attributes among a group of stimuli. The concrete attribute shared by objects can be perceived through any of the senses. For example, 'hard objects' (lamppost, door, hammer) would be tactile knowledge, 'they all make sounds' (radio, television, phone) would be auditory, and 'give light' (lamp, flashlight, candle) would be visually perceived. All descriptive labels must contain a reference to a commonly shared physical attribute of the grouped stimuli. Where a visual perception is the basis for the grouping, the shared attribute does not have to be drawn onto all the objects grouped. In this way a group such as 'all have knobs' (radio, television, clock) is labeled 'descriptive' even though the knob is not visible from the angle at which the object is viewed in the drawing. It is 'descriptive' because the knob is an integral and necessary part of the physical structure of the object."

Turning next to the inferential category, the scoring rules were as follows: "These concepts classify objects because of some characteristic shared by all, but what they share is not inherent in the physical nature of the stimuli grouped. These labels do not contain a direct reference to an objective, physical attribute of the group of similar stimuli (unlike 'descriptive' labels), and yet each object is an individual instance of the label (unlike 'relational' concepts). The classifications made fall generally into the areas of usage and location. Examples of groupings based on usage would be 'for eating' (fork, spoon, cup, glass), or 'boats' (canoe and rowboat). This second group is indirectly based on usage since the general class of boats is composed of objects that can do and are used to do a similar task--travel on water. Examples of location would be 'objects you would find indoors' or 'things you might see outside.' "

Finally, we consider the scoring rules for the relational category: "The distinguishing characteristic of these conceptual labels is that they grow out of the relationships between or among the stimuli grouped together and then serve as a kind of umbrella over the collection. Because of this, no stimulus is an independent instance of the concept, and some have had greater weight in determining what the concept became than did others. These relationships among the stimuli grouped together are functional, and build on connections of a temporal, spatial, or complementary nature. The temporal-spatial complexes are concrete or situational in nature, generally thematic. A typical theme might be 'getting ready to go out' (comb, lipstick, watch, pocketbook, door). No single object is an example of the label that envelops it. A typical complementary relationship might give rise to the label 'to put money away,' where the stimuli (coin, purse) are both clearly necessary to achieve the single goal suggested."

What is the interjudge reliability for coding responses into the three rubrics of conceptual style outlined above? The 151 subjects of the study generated a total of 1730 groupings (exclusive of singles) in the object-sorting task. Of this total, 1561 yielded agreement between two judges in regard to the kind of conceptual style--descriptive, inferential, or relational--reflected by the response.[1] In short, percentage agreement on the conceptual style indexes is equal to 90%. All scoring was carried out without awareness of the given child's identity. The 169 disagreements were resolved by discussion between the judges.

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[1] When two different types of reasons were given for a single group, the first one was taken if both were adequate or inadequate. If one was adequate and the other not, the adequate one was selected.

A child's scores regarding conceptual style in object sorting consist of the percentages of his groupings (exclusive of singles) categorized as descriptive, inferential, and relational.

Thematic integration. The present procedure was third in the experimental sequence and concerned the telling of stories. The instructions to subjects were as follows: "In this game I am going to show you a card that has four words on it. It will be your job to tell a very short story using up all four words without changing them at all--

you know, don't add 's' or things like that. The story shouldn't be longer than 2 or 3 sentences. Here is an example: armchair, ranch, watch, cards." (The experimenter shows the words printed on a card to the subject). "Now you might tell the story like this: 'The man in the armchair looked at his watch and decided to go back to the ranch. He put the cards in the drawer, cleaned up his desk, and soon left the office.' You see, all four of the words are used in this little story. Now on the next card it will be your turn to tell a story. You can tell any kind of story you would like and use the words in any order you would like as long as you use all of them. There's no need to rush. O.K., here we go."

The experimenter then showed the subject the first set of words printed on a card and instructed him to make up a story using all four words. Four more sets of four words each followed in sequence. The five items comprising the instrument were as follows:

1. job, sky, sand, people
2. book, gun, pool, dream
3. ring, car, grass, rope
4. night, dog, medicine, flower
5. lamp, fence, overcoat, cup

When reading the words on the card to the subjects, the experimenter varied their order to insure that the child did not expect them to be used in a fixed sequence. Since the use of all four words was crucial in scoring the present task, this aspect was emphasized again at the end of the instructions.

The children's stories were analyzed in terms of two clearly defined categories, labeled 2-type and 0-type stories. When a story was not clearly within either of these groups, it was rated as a 1-type story. In using the scoring criteria, care was taken to avoid being misled either by the child who had a slick or sophisticated story-telling style or, at the other extreme, by the child whose lack of story-telling finesse obscured the qualities that did exist in his or her stories.

Turning first to the 2-type category, this score was intended for stories which were well-integrated and imaginative in theme and/or details. Those details meriting a 2 value fell in the areas of humor, fantasy, fancifulness, and drama. In general, it was impossible to separate a detail from a total theme--a fanciful detail will be part of a story with a generally fanciful flavor. Stories with details different in tone from the bulk of the story do occur, however, and these were given a 1 rating unless the child thoroughly integrated the detail into the story's action. A few examples of different types of 2-stories are listed below.

Humor: "A few nights ago my father acted a little unusual. He was reading in bed and fell asleep over his book and left the lamp on all night. In the morning he took his cup of coffee and almost drank the cup with it. Then he put his overcoat on backwards and as he said goodbye to us crashed into the board fence."

Fantasy: "One night when I was sleeping a dog came barking at my window. I jumped out of bed and ran to my window to see what had happened. The dog had found a bottle of strange medicine with an ugly color. I opened my window and took it from him. Then I went to my flower bed and poured it on them. In a very short time they had grown 20 feet tall. From then on I had the tallest flowers in the whole country."

Fanciful: "The very tired man opened the fence on the walk to his house. He came in and threw off his overcoat. Accidentally, his overcoat hit a lamp and the lamp hit a cup that was very valuable. The dog was standing nearby wagging his tail. By sheer miracle the cup fell on the dog's tail and it held there until the master could get to it. The dog was rewarded greatly by his master."

Dramatic: "I tied a rope onto the car and onto the garage, and I had the car and went 102 miles per hour. The rope broke and the car went all over the grass. I had bet a ring that the rope wouldn't break."

We now direct our attention to 0-type stories. A zero score was given where the story lacked integration with the consequence that the words in the story were more prominent than the story theme. The scorer's attention is drawn to story fragments which are not unified into a meaningful whole. These 0-type stories may make little sense or may lack a flavor of wholeness. An example of a 0-type story having meaning but lacking integration follows:

> "My job is to sand. People look at the sky."

A 0-type story manifesting integration but little meaning is the following:

> "This lady had a dream that she found a gun and shot a book and then read the book and went to the pool and finished it."

Most stories rated zero because of poor integration were really "skeletonized" versions which could conceivably achieve wholeness by addition of details. However, some stories sufficiently integrated to warrant a score of 1 also were lacking in detail, so that brevity as such was never an adequate cause of a zero rating. At the same time, it is typical of 0-stories that the poorness of the integration draws attention to the skeletal structure.

For the "Telling Stories" procedure, we are able to report both inter-scorer and internal consistency reliability. Agreement between two judges in scores of low, medium, and high quality across the total of 755 responses was 80%. Once again, the materials were scored without knowledge of the identities of the particular children. The present procedure also displays a satisfactorily high degree of internal consistency. The Spearman-Brown odd-even reliability coefficient is .74. Item scores of 0, 1, or 2 were summed in obtaining this coefficient.

Three scores are derived for each child: number of low, number of medium, and number of high quality stories. Given the differences between the 0-type and 2-type scoring categories, it seemed more informative to keep these three scores separate rather than combine them.

Results and Discussion

In Table 39 the two sexes are compared on the various categorizing and conceptualizing measures. The sexes are similar on all but two indicators; namely, boys use a descriptive style more often than girls in sorting objects, and boys exhibit broader band-width than girls--a frequently replicated finding. Turning to interrelationships among the various categorizing and conceptualizing measures, Table 40 indicates that correlations are rather low (with the exception of experimentally dependent scores).

Tables 41 and 42 present the relationships between creativity and intelligence on the one hand, and band-width behavior on the other. At issue here is the question of whether creativity and intelligence impinge upon the process whereby children set limits or boundaries in the case of concepts already in existence. The band-width measure indicates whether the child prefers to set his category limits closer to or further from a given central tendency value. The major finding is a relationship between creativity and the setting of broad category boundaries. In general, the creative child is more willing to tolerate deviant instances as possibly warranting membership in the category. In other words, the more creative children seem to display greater cognitive "energy"--they insist upon turning over possibilities until less likely and therefore more deviant and novel cognitive elements have been unearthed. The seeing of connections between disparate events through placing them in a common category--a process which is implied in the setting of wider tolerance limits for acceptance of potential instances in a class--thus may well be found in the child whose associational processes reflect greater creativity.

Next we consider the results from the object-sorting procedure, followed by the findings from the thematic integration task. Regarding the object-sorting measures, we shall confine our consideration of results to the boys, since the females yielded non-significant relationships for all measures in the object-sorting task. For the boys, the compartmentalization measure yields no relationships to creativity and intelligence, but the conceptual differentiation index yields the findings reported in Table 43. Interpretation of these results requires consideration of the conceptual style data for the object-sorting task, as presented in

Tables 44 and 45 for inferential and relational reasons respectively (there are no effects in the case of descriptive reasons). In order to interpret the findings of Tables 43, 44, and 45, it will be desirable first to review several theoretical considerations.

It has typically been assumed by Kagan, Moss, and Sigel (1960, 1963) as well as by other investigators that responding on a relational or thematic basis represents an intellectually inferior manifestation. This may well be true when the stimuli to be grouped are few in number and their thematic characteristics highly salient, as has been the case in the studies just cited. Thematizing under such circumstances may represent a passive, global approach to the materials provided. In the object-sorting procedure that we employed, however, a large number of stimuli were present, and their nature as well as the instructional context were such as to reduce markedly the prominence of thematic relationships. The child was encouraged to group in terms of abstractions, since the instructions implied to him that similarity be used as the basis for sorting. In addition, the objects were commonplace physical things, and there were many of them. Under these circumstances, it might well be the case that relational or thematic grouping would constitute a free-wheeling, unconventional type of response to the given task, in contrast to the more customary practice of sorting the objects in terms of common elements, whether such elements be descriptive or inferential. Constraints arising from the nature of the stimuli would be considerably stronger in the case of groupings based upon shared descriptive or inferential properties. Groupings based on relationships or themas, on the other hand, would permit greater free play for the evolving of unique combinations of stimuli. With these considerations in mind, let us return now to the results.

The findings for the males point to a particularly clear phenomenon. The group of high intelligence but low creativity stands out as avoiding the use of thematic or relational bases for grouping. Rather, they concentrate on inferential common elements. For whatever reasons--and the reasons may differ in the case of different groups--the other three groups are more willing to indulge in thematic forms of conceptualizing. Such findings reinforce the hypothesis that thematic responding may, under the conditions of the present procedure, represent a more playful, imaginative approach to the grouping task than does strict common-element sorting.

To suggest that the low incidence of thematizing by the high intelligence-low creativity group is evidence for an avoidance reaction, however, is to imply a further distinction. In principle, a low incidence could reflect either an inability to thematize or an avoidance of it. In the thematic integration procedure, however, we assessed the ability of the children to integrate a set of words into a unified thema in story telling: that is, thematizing was required of the child. Under such conditions, we find in Table 46 that the high intelligence-low creativity group of boys thematizes as well as the group high in both creativity and intelligence. It is when the option not to thematize is available that thematizing drops out of the behavior of the high intelligent-low creative group. Such evidence, then, suggests that we are dealing with a disinclination to thematize on the part of this group, not an inability to thematize.

It has typically been proposed in work on cognitive development (e.g., Bruner & Olver, 1963) that the most mature cognitive functioning involves inferential abstraction--the kind of organizing that would be reflected in terms of sorting objects on the basis of shared inferential properties. Thematizing has been considered a developmentally primitive response. Our findings suggest, however, that a more critical consideration may be the relative balance between conceptual-inferential and thematizing tendencies. Consider the results for the various groups of boys on the object-sorting task in somewhat more detail. For both of the high creativity groups, the relative incidence of thematizing _and_ inferential-conceptual grouping is fairly high. For the high intelligence-low creativity group, the relative incidence of thematizing is quite low, while the relative incidence of inferential-conceptual sorting is quite high. Finally, for the low intelligence-low creativity group, the relationship is reversed; the incidence of thematizing is high, while the incidence of inferential-conceptual sorting is relatively low.

In sum, the creative boys seem able to switch rather flexibly between thematizing and inferential-conceptual bases for grouping; the high intelligence-low creativity boys seem rather inflexibly locked in inferential-conceptual categorizing and strongly avoidant of thematic-relational categorizing; and finally, the low intelligence-low creativity boys tend to be locked within thematic modes of responding and relatively incapable of inferential-conceptual behavior.

Turning finally to the results for the thematic integration procedure for the girls, we find in Table 47 that the number of low-quality (0-type) stories is highest in the group low in both creativity and intelligence. Creativity as well as intelligence status is important to assess, therefore, in order to predict the girls for whom incidence of fragmented, atomistic stories will be maximal.

Of special interest, however, are the findings which suggest a relative avoidance of thematizing on the part of the high intelligence-low creativity boys. The implication is that this group of boys is least willing to engage in cognitive behavior of a relatively free-wheeling, unconstrained type. Such an interpretation is comparable to that which was suggested for the high intelligence-low creativity group of girls on the basis of the observation-rating findings discussed in the previous section of this report.

V. PHYSIOGNOMIC SENSITIVITY

One can distinguish "physiognomic" or "expressive" properties of visual stimuli from "physical" properties of such stimuli. Properties of the former type refer to possible affective or emotional connotations which these stimuli may possess; properties of the latter type, in contrast, refer to such information as form, size, and color. Interest in physiognomic sensitivity in relation to creativity arises from the consideration that sensitivity to physiognomic properties involves the seeing of possible relationships between two quite diverse realms of experience: visual configurations on the one hand, emotional states on the other. The ability to detect such relationships, or the willingness to propose them as possibilities, thus may be involved in the psychological make-up of creative individuals.

Procedure

Our methods for exploring physiognomic sensitivity were four in number. They represented an attempt on our part to sample major lines of potential variation in this domain, both with regard to stimulus materials and with regard to type of response.

Free Descriptions of Stick Figures

The stimulus materials in this procedure are 35 line drawings of human-like stick figures derived from the work of Sarbin (1954) and Sarbin and Hardyck (1955). With an open circle for a face, the expressive potential of each stick figure is conveyed solely by means of postural cues. To adults, the stance of each stick figure readily carries an emotive connotation (Sarbin, 1954). Figure 4 reproduces four of the 35 stick figures to illustrate the nature of these stimuli. The numbers refer to their positions in the sequence of 35. Each stick figure is presented on a card.[1]

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[1] We are grateful to Theodore R. Sarbin for permission to use his stick figure materials.

The present task, which came second in the series of 17 procedures, was introduced to the child with the following instructions:

"This game is a stick figure game. Do you know what a stick figure is?" (The child is permitted to answer.) "Well," (or "Yes,") "a stick figure is a drawing of a person made with simple lines. Here is one." (An example figure not used in the procedure proper is shown to the child.) "Now in this game your job is to describe each stick figure--to tell me all you can about each one. You may have a lot to say about some of the stick figures, and nothing at all about some of the others. You just say as much as you want to. O.K.? Let's begin now.

"Here is the first one. Now tell me all you can about this stick figure."

The first card is handed to the child as the above line is spoken. When the child finishes his description, the experimenter hands him the second card, saying: "Here is another. Now tell me all you can about this stick figure." Analogous instructions prevail for the remaining 33 cards in the set.

The child's descriptions of the stick figures were recorded verbatim by the experimenter. The 35 descriptions for each child were subjected to a content analysis which proceeded in terms of the following scoring considerations. Our basic concern was with the extent to which the child would respond exclusively in terms of physical characteristics of the stick figures or rather would also include or even emphasize the attribution of emotional states. In order to measure this kind of difference, scoring definitions were prepared which contrasted three types of descriptions, assumed to vary along a dimension ranging from concentration on physical properties to concentration on the physiognomic. Presented below are the scoring definitions learned by each judge:

"The description of each stick figure will be scored 'low,' 'medium,' or 'high.' If the child includes material in a description that should receive more than one type of score, assign him the score of the highest ranking answer given.

"Score 'low' if the stick figure is described in terms of physical characteristics and the description is specific to parts of the body considered in isolation. The description is in "geometric-technical" terms and is atomistic. For example, 'finger bent,' 'elbow bent.'

"Score 'medium' if the stick figure is described in terms of physical characteristics, i.e., not in terms concerning affective states or personality qualities, but the stick figure is described as a whole. Usually in this kind of answer a state of action is described (e.g., 'leaning,' 'bending'), or an occupation (e.g., 'he looks like an umpire'). Also score 'medium' for description of the stick figure as a non-human entity (e.g., 'a flower').

"Score 'high' if the stick figure is described in terms that directly (not implicitly) express the stick figure's emotive response to any situation. For example, 'he's angry at someone.' Mention of affective qualities as such also earns a score of 'high.' For example, 'happy,' 'sad,' 'stern,' 'graceful.' As the example of 'stern' indicates, judgments of character are included here. Quotations which define the internal affective state of the stick figure also are included. If an affective state description is deemed stereotypical by the judge, so that it may reflect merely a verbal habit rather than a response to the stick figure, it is scored 'medium' rather than 'high' (e.g., 'bigshot')."

The 35 descriptions provided by each of the 151 children (hence 5285 descriptions in all) were scored by two independent adult judges. Each judge worked "blindly," i.e., without knowledge of the identities of the children whose protocols were being scored. Scoring reliability was assessed by counting the number of agreements between judges in scores of "low," "medium," and "high," assigned to the total set of descriptions, and dividing by the total number of descriptions. This agreement quotient was .95. Scoring discrepancies were resolved by discussion between the judges.

Three measures were derived for each child: the number of descriptions scored "low," the number scored "medium," and the number scored "high." The total of these frequency counts must, of course, be 35. It seemed appropriate to keep these three measures as separate variables since it was possible that individual differences would display themselves more clearly in the case of one of them than another.

Free Descriptions of Paths

The stimulus materials for this task comprise the cards from the Line Meanings procedure presented in Figure 3. These lines are among a number that were developed by Tagiuri (1960).[2] The present task came eleventh in the sequence of 17, following the Line Meanings procedure in the same session. It was introduced to the child in the following manner:

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[2] Thanks are due Renato Tagiuri in connection with the present procedure.

"Here is another question about these lines. This time I would like you to imagine that each line is a trail of footprints a person has made by walking through a desert. Pretend that you are up above looking down and seeing the trail this person has made. Here, I will show you what I mean."

At this point the experimenter puts a sheet of white cardboard, 15 in. by 20 in., on the table before the child. The cardboard has drawn on it a heavy black line that follows a somewhat undulating path. The child is asked to stand in front of this cardboard so that he is looking down upon it. Then the experimenter takes out a stick figure constructed from a pipe cleaner and standing about 2 inches tall. She moves the stick figure in such a way that it follows a route on the cardboard from the start of the path at the child's left to the end of the path at the child's right. When the figure has been moved to the end of the path it is left standing there. This same procedure, with the path in the same orientation, is followed with each child. The experimenter then continues:

"You see, you are looking down on the trail this person has made just as though you were high above it. Do you see what I mean?" (If the child indicates that he does not, then the experimenter repeats the demonstration just described, with the explanation that was just indicated.) "Fine. Now, when you look at the little cards, there won't be any person there--but it will be your job to imagine that he is there and to guess what sort of person he is to have made this particular trail. You just look at the trail of footprints and it will help you to tell me what the person who made it must be like. Do you see how we play this game? Good. Then let's begin."

The experimenter presents the child with the first card, and goes on:

"Here is the first trail of footprints. Hold the card straight, like this, and imagine that this is a trail some person has made--that you are looking down from up high and seeing how it goes along from where it started (the experimenter points to the path's beginning) to where it ends (the experimenter traces the path to its end). What sort of person do you think made this trail?"

Analogous instructions are provided for each of the remaining paths. The child's description in each case is recorded verbatim by the experimenter. The nine descriptions generated by this procedure were subjected to a content analysis similar to that used for the Free Descriptions of Stick Figures procedure. A two-category distinction proved appropriate to draw for the present materials: presence vs. absence of a physiognomically sensitive description. "Presence" corresponded to the scoring category of "high" defined for the preceding task. If the child included material in a description that should receive both types of score, he received the "high" score.

Nine descriptions were provided by each child (hence 1359 descriptions in all). These were scored by two independent adult judges, both once again working without knowledge of the identities of the children. Reliability of scoring was measured by dividing the number of interjudge agreements in scores of "high"and "not high" by the total number of descriptions, yielding an agreement quotient of .85. Discrepancies between the judges were resolved by discussion. The measure for each child consisted of the number of descriptions scored "high." The range of this variable was, of course, 0 to 9.

Emotive Connotations of Abstract Patterns

Whereas the posture of a stick figure concerned us in the first task, and the movement path of a person-as-a-unit concerned us in the second, the stimulus materials in the present procedure consist of non-representational patterns. One can think of the stimuli in these three tasks as forming a series that increases in abstractness as far as relevance to human affective states is concerned. The abstractness of the stimuli in this third procedure requires us to change our dependent variable from a free description approach to a forced choice between two visual pattern translations of a given state of emotion, one translation considered appropriate and the other inappropriate by adult judges. The affective states were indicated to the child by means of photographs of the face of an adult female representing diverse emotions.

The five abstract patterns used in this procedure are presented in Figure 5. The four facial photographs representing affective states were taken from the Lightfoot series developed by Engen, Levy, and Schlosberg (1957; 1958). Most of the pictures in this series are reproduced in Morgan (1956). The four photographs used in our work are numbers 1 ("happy-a"), 39 ("happy-b"), 51 ("angry"), and 56 ("sleepy") as presented in Morgan (1956, pp. 32-33).[3] The first two clearly depict a happy emotional state, the third, an angry state, and the fourth, a state of sleep. All are photographs of the same actress.

The task involves presenting the child with two of the patterns and requesting him to select the one which better fits the expression in a given facial photograph. Twenty-two such choices are made, each involving a different constellation of two patterns and one face. The 22 triads retained for the task were those on which three independent adult judges agreed regarding which choice for each triad was the physiognomically appropriate one. In those triads wherein a particular pattern appears, it does so sometimes as the left-hand member of the pattern pair, sometimes as the right-hand member, so that left-right

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3. We are grateful to Harold Schlosberg for advice in connection with the use of these photographs.

positions for a given pattern are approximately balanced. Left-right positions of the correct choices also are approximately balanced.

The instructions for the task and the actual choices offered are presented below. Each triad is referred to by the term describing one facial expression followed by the numbers of two patterns from Figure 5 in their left-right arrangement. The correct choice in each case is underlined.

"This is a matching game. I have some lines drawn on cards (these are shown to the child) and I also have some pictures of a lady's face (these too are now shown). I am going to show you two of these lines together with one picture of the lady's face, and it will be your job to pick the line that seems to be most like the way the lady feels. There are no right or wrong answers in this game. Everybody has a different idea about it, but since you'll be seeing the same lines and faces more than once you'll want to be sure to look carefully each time. Just remember always to pick the line which seems to you to be most like the way the lady feels. Let's try one now and you'll see how easy it is.

(1) "Here are the two lines and here is the lady's face. Which of the lines is most like the way the lady feels?" Happy-a: I, IV

(2) "And here are two lines and here is another picture of the lady. Which of the lines is most like the way the lady feels in this picture?" Sleepy: III, V

(3) "Which of the lines is most like the way the lady feels in this picture?" Happy-b: IV, II

(4) The query for each successive item is similar to the one given above. Angry: I, III

(5) Happy-a: II, V

(6) Sleepy: III, IV

(7) Happy-b: V, I

(8) Angry: II, III

(9) Happy-a: I, V

(10) Sleepy: III, II

(11) Happy-b: IV, I

(12) Angry: V, II

(13) Happy-a: IV, III

(14) Happy-b: III, IV

(15) Angry: V, I

(16) Happy-a: IV, II

(17) Sleepy: I, III

(18) Happy-b: II, V

(19) Angry: I, IV

(20) Happy-a: V, III

(21) Happy-b: III, V

(22) Angry: IV, II

The procedure fell seventh in the sequence of 17. The score for a subject can vary, of course, from 0 to 22.

Bizarre Emotive Attributions for Stick Figures

Our interest in the present procedure was to invite the child to entertain the possibility of relatively bizarre (unconventional) attributions of emotional states for given stick figures. In contrast to the procedure just described, the question here was not one of discriminating between an appropriate and an inappropriate physiognomic translation of an emotional state. Rather, the child was permitted to accept both kinds. Our question was: If a child is allowed to accept obviously appropriate linkages between the posture of a stick figure and an affective happening, will he also accept bizarre possibilities or will he reject the latter?

A set of 24 stick figures was chosen from among the larger number used in the Free Descriptions of Stick Figures procedure. For each figure, three labels were assigned describing affective states: one state deemed bizarre for that figure, another deemed highly appropriate for that figure, and a third deemed moderately appropriate for the figure in question. Three independent adult judges had been given the three labels pertaining to each figure, and had been requested to select the label whose affective attribution was most bizarre, and the label whose affective attribution was most appropriate, for the stick figure in question. The 24 figures and their respective sets of labels were those in the case of which all three judges had agreed in their choices of the most bizarre and the most appropriate emotional attributions.

As examples of the kinds of descriptions provided, we present the labels that were assigned for each of the figures illustrated in Figure 4. The label that was judged most appropriate for a given figure appears first, and the label that was judged most bizarre for a given figure appears last, in the set of three. Stick Figure 12: Does he seem to be joyous? Does he seem to be excited? Does he seem to be angry? Stick Figure 16: Does he seem to be taken by surprise? Does he seem to be scared? Does he seem to be happy? Stick Figure 22: Does he seem to be very angry? Does he seem to be ordering someone around? Does he seem to be peaceful? Stick Figure 28: Does he seem to be very angry? Does he seem to be excited? Does he seem to be searching?

All 24 stick figures were presented one at a time with a question about one of each figure's three labels. Then the 24 stick figures were again presented one at a time (in the same order) with a question about a second of each figure's three labels. Finally, the 24 figures were presented once more in the same sequence, and the child was asked about the third of each figure's labels. The inquiry about a stick figure's bizarre label took place for eight of the figures during each of the three presentations. The eight questions about bizarre labels were spaced in a random sequence within each series of 24 presentations.

Instructions for the present task, which occupied the eighth position in the sequence of 17 procedures, are as follows:

"This is another stick figure game. You remember that a stick figure is a drawing of a person made with simple lines. I am going to show you a stick figure and ask you a question about it. Your answer should be either yes or no, nothing else but either yes or no, depending on what you think about the stick figure. There are no right or wrong answers. Everybody has a different idea about it, so any way at all that you want to answer is fine. All right. Here we go now.

"Here is the first stick figure. I'd like your opinion about him. Does he seem to be thinking?"

Analogous questions then were asked for each of the 23 remaining stick figures in the series. The sequence of 24 figures then was repeated a second and a third time. Three scores are derived from these materials: the number of bizarre labels accepted by the child, the number of highly appropriate labels accepted by the child, and the number of moderately appropriate labels so accepted. In each case, of course, the possible score range extends from 0 to 24.

Response Reliabilities

Table 48 gives the Spearman-Brown split-half reliability coefficients for the various physiognomic indexes. In the case of the Free Description of Stick Figures procedure, reliability was estimated for a single total score obtained by translating item scores of "low," "medium," and "high" into numerical values of 0, 1, and 2, respectively. This was necessary since the number of instances of each type of score varied, of course, from child to child. For the remaining procedures, the reliability coefficients pertain to the scores as described in the preceding material.

Results and Discussion

A first question to consider is the possibility of sex differences on the physiognomic sensitivity measures. In Table 49 the two sexes are compared on the various measures, and we find that, with one exception, sex differences do not occur. Turning next to the question of possible relationships among the physiognomic sensitivity indicators within each sex, the relevant information is presented in Table 50. We find that, for the children of each sex, the various measures are relatively independent of one another. The implication is that the physiognomic sensitivity domain seems to be multidimensional rather than unidimensional. That is, when reasonably reliable measures are constructed which sample various kinds of stimuli and responses, these measures tend to be minimally interrelated, even though each of them possesses face validity as reflecting some aspect of the potential interconnections between affective and visual experiences. The various measures under study, therefore, must be considered separately rather than combined into a single score. We turn next to the question of how each of these measures varies with creativity and intelligence levels.

In Tables 51 through 58 are presented the significant findings regarding relations between the physiognomic sensitivity measures on the one hand, and the creativity and intelligence distinctions on the other. It will be convenient to consider first the results for the first three physiognomic procedures (Tables 51 through 57), and to turn afterward to the results for the fourth procedure (Table 58).

The first three procedures were designed to provide coverage of a range of stimulus materials extending from those which possess a concrete depictive referent in human behavior (Free Descriptions of Stick Figures), through those dealing with the person as a unit moving through space (Free Descriptions of Paths), to stimulus materials whose linkage with human behavior is only abstract and non-depictive (Emotive Connotations of Abstract Patterns). For the boys, the findings on these three tasks are consistent with what might be called an additive model. According to such a model, creativity and intelligence both will contribute to physiognomic sensitivity, with the result that such sensitivity will be maximal in the joint presence of high creativity and high intelligence, will be minimal when both are low, and will be intermediate when one is high and the other low. That both creativity and intelligence can further physiognomic sensitivity suggests that such sensitivity can involve the following two processes: the capacity to make inferential translations from one mode of experience to another--reflective of the general intelligence concept; and associational freedom, thereby providing a wider range of experience from which to draw in making inferential linkages--reflective of the creativity concept.

The results for the girls are consistent in part with this formulation, but suggest also a further mechanism. In the two tasks whose stimuli provide depictive referents for human behavior, the high creativity-low intelligence group performs about as poorly as the low-low group. Possibly, therefore, the high creativity-low intelligence group is avoiding making physiognomic discriminations for motivational reasons. Such an interpretation is consistent with the view of this group which has emerged from earlier evidence: it will be recalled that this group was found to be socially avoidant, shunned by others, and involved in solitary fantasy activities. Thus, while the poor physiognomic sensitivity of the low-low group may reflect a general lack of capacity not specific to the physiognomic domain as such, the equally poor sensitivity of the high creativity-low intelligence girls may reflect an avoidance of specifically physiognomic discriminations for motivational reasons.

The results for the fourth procedure (Bizarre Emotive Attributions for Stick Figures), in turn, are contained in Table 58 for the girls. In the case of the boys, the findings on this procedure were non-significant. Although the four groups of girls do not differ in regard to their acceptance of highly appropriate or moderately appropriate affective attributions for the stick figures, they differ in a particular way regarding acceptance of the unconventional attributions. The group high in intelligence but low in creativity exhibits a conspicuously low level of such acceptance. Although the rate of acceptance of such attributions by the other three groups is generally quite low (about five per cent), the high intelligence-low creativity group accepts virtually none at all. The comparability among the groups regarding acceptance of appropriate attributions acts as a control, indicating that the differential acceptance behavior just described relates to the entertainment of unconventional attributions in particular, rather than simply to the acceptance of any kind of affective labels. Furthermore, Table 50 indicates that there is no relationship between degree of acceptance of unconventional and of appropriate attributions. It is safe to conclude, therefore, that an acquiescence or "yea-saying" response set cannot account for the differential acceptance of unconventional attributions.

The implications of the present findings appear to be quite similar to the thematizing results considered earlier in the case of the boys. In both cases, the high intelligence-low creativity group is intolerant of unlikely, unconventional, types of hypothesizing about the world. This particular group appears conspicuously loathe to "stick its neck out," as it were, and try something that is far out, unconventional, and hence, possibly "wrong." It is of particular interest that the high intelligence-low creativity group of girls avoids entertaining the possibility of unconventional emotional attributions under the present experiment's conditions. Recall that the entertainment of such possibilities has no effect upon the availability for acceptance of the likely and highly appropriate possibilities; it is not an "either-or" situation. The high intelligence-low creativity girls seem to be so attuned to error that even where appropriate responses are not sacrificed, they refuse to deviate from a critical standard of "correctness."

VI. PERSONALITY STUDIED THROUGH SELF-DESCRIPTION AND FANTASY

Two particular personality variables--anxiety and defensiveness--seemed, on the basis of previous theory and evidence, to be likely possibilities as potential correlates of the creativity-intelligence groupings. With regard to anxiety, we conceive of the term as referring to an experiential state that is perceived as basically unpleasant, with the frequent presence of physiological concomitants. Many studies (see, e.g., Ruebush, 1963) attest to the existence of an inverse relationship for children between anxiety measures and traditional intelligence indexes. There is, in contrast, a striking paucity of empirical work on the question of possible relations between anxiety and creativity in children. Studies on the anxiety-intelligence relationship in children have tended to conceive of anxiety as causally prior, and as exerting an interference effect upon intellective performance.

Defensiveness, in turn, is conceived of as a particular style of coping with anxiety--a style characterized by the construction of a protective shield against awareness of anxiety's presence. While few studies of the relationship between defensiveness and intelligence are to be found, those that deal with issues of potential relevance to this question (e.g., Ruebush, Byrum, & Farnham, 1963; Zimbardo, Barnard, & Berkowitz, 1963) suggest that defensive children exhibit impairment in cognitive contexts distinguished by unfamiliarity and/or ambiguity. Since conventional intelligence tests are, in contrast, relatively familiar and unambiguous in nature, one would expect minimal relationships between intelligence.measures and defensiveness. If we turn now to consider the tasks used as indicators of creativity, it is evident that they are likely to strike the child as relatively strange and ambiguous in nature, since they are characterized by a lack of clear evaluative standards. On this basis, defensive children thus might well show lower levels of creativity than their less defensive counterparts.

The hypothesis of an inverse relationship between creativity and defensiveness has been frequently enunciated in the clinical literature (e.g., Kubie, 1958), and some empirical research of relevance to this hypothesis has been conducted with adults (e.g., Barron, 1963). There has, however, been no previous empirical work concerned with this question in the case of children. The theoretical basis that we had fashioned for this hypothesis may be put as follows. The associative conception of creativity presupposes the availability of disparate and hitherto unrelated strands of experience among which new connections may be made. Defensiveness, in contrast, implies a narrowing of awareness regarding certain kinds of experiences and thus a reduction in the range of cue availability characteristic of high levels of creativity. The consequence, therefore, should be a relative lack of capacity to integrate diverse elements of experience. In the formulation just described, defensiveness clearly has been assigned the causal role and creativity the role of consequent.

Although the interpretative concepts reviewed have placed anxiety and defensiveness in the antecedent role and intelligence and creativity in the consequent role, it also is possible to conceptualize the causal relationships as running in the reverse direction. At any rate, we do not wish to prejudge the issue, and hence shall use modes of analysis that will permit us to view both directions of causal possibilities: creativity and intelligence as a function of personality, and personality as a function of creativity and intelligence.

Procedure

Self-Report Measures

An 88-item self-descriptive inventory was administered individually to all children. Administration of this instrument took place following the completion of all of the creativity, physiognomic sensitivity, and categorizing and conceptualizing procedures. Since many of the items in the self-descriptive inventory contained negative affect, we placed the inventory late in the sequence of procedures to insure that there would be no adverse effect on the relaxed, game-like atmosphere maintained for the earlier procedures.

The instructions to the inventory, presented orally by the experimenter but also available for the child to read, were as follows:

"This game is called 'What I am like.' There are a lot of sentences printed below, and you are to pick out all the ones that seem to describe you. If a sentence does describe what you are like, draw a circle around it. But if a sentence does not describe what you are like, then leave it as it is and go on to the next one. There's no need to rush."

The experimenter sat passively by as the child worked on the inventory. If a child seemed to be having a great deal of difficulty making decisions, the experimenter might say: "You don't need to take much time with this. Just do what your first feeling about it is."

The following scales were represented: anxiety, test anxiety, defensiveness, test defensiveness, social extraversion fillers, and general fillers. The anxiety, test anxiety, and defensiveness scales were adapted from the work of Sarason and his associates (Sarason, Davidson, Lighthall, Waite, & Ruebush, 1960; Davidson & Sarason, 1961). The remaining scales are of secondary interest. We constructed a "test defensiveness" scale to note whether this quite specific form of defensiveness can be subsumed under a general defensiveness construct. The social extraversion items were adapted from the Minnesota T-S-E Inventory (Evans & McConnell, 1957). Finally, six innocuous items intended as general "fillers" were included in the inventory, but were not scored.

Items were keyed in the direction of the scale label. Higher scores thus reflect greater anxiety, test anxiety, defensiveness, etc.

Reliabilities (coefficient alphas) were computed on the total sample for each of the scales. For the three scales of major interest, the reliabilities were as follows: .86, .87, and .74 for anxiety, test anxiety, and defensiveness, respectively. Turning to the scales of lesser import, the reliabilities were .63 and .48 for test defensiveness and social extraversion, respectively.

Listed below are the items contained within each scale. The numbers preceding each item indicate the position of the item in the inventory.

Anxiety

7. I am afraid of things like snakes.
8. I get a scary feeling when I see a dead animal.
13. I am afraid of spiders.
19. I worry that I might get sick.
31. When I am in bed at night trying to go to sleep, I often find I am worrying about something.
34. I get scared when I have to go into a dark room.
42. I am afraid of being bitten or hurt by a dog.
45. Some of the stories on radio and television scare me.

46. I think I worry more than other boys and girls.

53. I am frightened by lightning and thunderstorms.

56. When I am alone in a room and hear a strange noise, I get a frightened feeling.

57. I worry that I might get hurt in some accident.

67. When I am away from home, I worry about what might be happening at home.

68. I am frightened when I look down from a high place.

75. I sometimes get the feeling that something bad is going to happen to me.

76. I sometimes worry about whether my father is going to get sick.

77. I get scared when I have to walk home alone at night.

80. Without knowing why, I sometimes get a funny feeling in my stomach.

83. I sometimes worry about whether my mother is going to get sick.

87. I get worried when I have to go to the doctor's office.

Test Anxiety

11. When the teacher asks me to read aloud, I am afraid that I am going to make some bad mistakes.

15. I worry a lot while I am taking a test.

21. When the teacher says that she is going to give the class a test, I become afraid that I will do poorly.

23. I wish a lot of times that I didn't worry so much about tests.

27. I sometimes dream at night that I did poorly on a test I had in school that day.

28. When the teacher says that she is going to call upon some boys and girls in the class to do arithmetic problems, I hope that she will call on someone else and not on me.

33. When I am taking a hard test, I forget some things that I knew very well before I started taking the test.

35. I think I worry more about school than other boys and girls do.

43. When I am home and thinking about my lessons for the next day, I worry that I will do poorly on them.

50. I sometimes dream at night that I am in school and cannot answer the teacher's questions.

52. When I am in bed at night, I sometimes worry about how I am going to do in class the next day.

54. I am afraid of school tests.

59. While I am on my way to school, I sometimes worry that the teacher may give the class a test.

60. I worry about being promoted at the end of the year.

61. I sometimes dream at night that the teacher is angry because I do not know my lessons.

71. When the teacher says that she is going to give the class a test, I get a nervous or funny feeling.

73. When the teacher says that she is going to find out how much I have learned, my heart begins to beat faster.

78. When the teacher says that she is going to find out how much I have learned, I get a funny feeling in my stomach.

82. When the teacher asks me to write on the blackboard in front of the class, the hand I write with sometimes shakes a little.

Defensiveness

3. I feel cross and grouchy sometimes.

4. I never worry about what people think of me.

5. I always tell the truth.

6. No one has ever been able to scare me.

9. I never get scolded.

14. I am sometimes afraid of getting into arguments.

16. I have never had a scary dream.

18. There are some people I don't like.

24. I like everyone I know.

26. I sometimes lose my temper.

30. I have never been afraid of getting hurt.

32. There are some things about myself I'd change if I could.

36. I never worry.

37. I don't feel sorry for any of the things I have done.

41. I'm sometimes sorry for the things I do.

44. I always do the right thing.

48. I never worry about something bad happening to someone I know.

49. I don't feel badly when someone scolds me.

51. I am never shy.

58. Sometimes when I get mad, I feel like smashing something.

62. I never worry about what is going to happen.

63. I never hurt anybody's feelings.

64. I sometimes dream about things I don't like to talk about.

69. I am never unhappy.

85. I never have arguments with my mother and father.

86. When I was younger there were some things that scared me.

88. I always know what to say to people.

Test defensiveness

10. I never worry about knowing my lessons.

12. I never worry about how well I did on a test after I've taken it.

39. I never worry when the teacher says that she is going to ask me questions to find out how much I know.

66. I never worry about my school grades.

74. If I am sick and miss school, I never worry that I will do more poorly in my school work when I return to school.

81. I never worry before I take a test.

Social extraversion fillers

17. I like to spend most of my spare time with friends.

20. I am a very lively person.

22. Once I make up my mind to do something, I do it.

29. I usually don't say much when I am together with other boys and girls.

40. I find it easy to make new friends.

55. I like to play pranks on other boys or girls.

70. When I am together with other boys or girls, I am usually the leader of the group.

72. I would rather have a few close friends than many friends.

79. Other people think I am pretty lively.

84. I am a person who likes to talk a lot.

General fillers

1. I like to watch television before dinner most evenings.

2. I like to play in the snow.

25. I like to go on trips with my mother and father.

38. I love to play games best of all.

47. I like to go to the beach in the summertime.

65. I like cartoon movies best of all.

Fantasy Measure

The children were read the beginnings of five stories, each having as a main character a child who is under stress of failure. At a critical point in each story's development, the child is asked to complete the story.

Verbatim instructions to the task were as follows: "This is another test like the one that you took when I last saw you, and it is the last one that I will give you. I am going to read you the beginning of a story and I am going to test you on how well you can finish it. Let's try the first one now, and remember, this is a test so try to do as well as you can." (The experimenter reads the first story.) "Now you finish the story by telling me how _______ thinks and feels, what happens, and how things turn out." The experimenter recorded all of the child's verbal output. Then she proceeded in analogous fashion with the remaining stories.

The stories were adapted from Miller and Swanson (1960) and follow below. Where only one story is presented--items 1, 3, and 4--the version presented to the boys is shown. The girls received identical versions except for the substitution of a female central character and associated feminine pronouns for the corresponding masculine forms. Where two stories are given--an "a" and a "b" version--the "a" story was read to the boys, and the "b" story to the girls. The names inserted into the stories were selected so as not to include those of any child in the class.

1. All his friends know that _______ likes music and wants to grow up to be a concert piano player. Some of them have laughed at him for thinking he could do this, but _______ has continued his practicing, even though he finds that it is getting harder and harder for him to play the music his teacher gives him. One day a famous musician visits his teacher. It is arranged for _______ to play for him. _______ thinks that he has played very well, but as he is leaving, he overhears the musician telling his teacher that _______ does not have enough talent to be a concert piano player and that it is a waste of

money for him to be taking lessons. It seems to _______ that his teacher is agreeing with the musician. _______ doesn't know what to do.

2a. _______'s father has always wanted him to be good at sports and has encouraged him to go out for the school teams. _______, though, is short and not very strong--in fact, he can't even run very fast. So in spite of practicing more than anyone else and trying very hard, he has been put off every team he has tried out for. He knows his father is very disappointed in him. He is disappointed, too, because he likes sports very much. Finally, he tries lightweight wrestling. After practicing a great deal, he is given a chance in a big match. But, he is too anxious to do well in the match. He gets so nervous that he is easily thrown. _______ feels so disappointed and embarrassed that he bursts into tears in front of everybody. After the match, the coach tells him he should give up sports.

2b. _______'s mother has always wanted her to be a wonderful dancer and has encouraged her to take dancing lessons. _______, though, is not very good at dancing--in fact, she can't even keep time to the music. So in spite of practicing more than anyone else and trying very hard, she has not done very well and has never been asked to dance in the dancing school show. She knows her mother is very disappointed in her. She is disappointed, too, because she likes dancing very much. Finally, _______ decides to give it one more try, and after practicing a great deal she is given the chance to do a dance in the show put on by her dancing school. But she is too anxious to do well at her dance. She gets so nervous that she trips and falls. ________ feels so disappointed and embarrassed that she bursts into tears in front of everybody. After the dance, the dancing teacher tells her that she should give up dancing lessons.

3. ________ is a fifth grader. Everything has gone wrong for him from the very first day in school this year. He's been having trouble with the work and he knows that the teacher, whom he likes, thinks he's dumb. He can never think of the right answers when he's called on in class. And he also has trouble getting along with the other kids. They all seem to have it in for him in class, on the playground, after school, all the time. When anything goes wrong, the kids or the teacher always blame it on him. One day he hears a couple of the boys talking about him and saying that nobody really likes him--and that nobody thinks he's any good. ________ feels like he just can't stand it any more.

4. ________ had always wanted to help his father in his work, so he begged his father to let him work in his office during the summer, His father finally agreed, but only on the condition that if there were any trouble at all, ________ would have to quit. He was very excited at being able to help his father, but somehow from the very first day things went wrong. He mixed up his papers, got in people's way, and

just couldn't seem to do anything right. His father was patient with him for a while, until one day _______ accidentally threw away the most important papers in the office. Everyone was very upset about it and _______ didn't know what to do. Very soon, _______'s father called him into the office, and he knew that his father had found out about his mistake.

5a. _______ has always felt he was no good. He has tried very hard to make a good impression on the other kids in the class and on his teacher, but usually they just seem to ignore him. He always seems to be making stupid mistakes and not understand the work they are doing. _______ has always dreamed that he would have a chance to show everyone that he is good at something, too.

One day his teacher brings the school's brand new movie projector into the room and announces that they will have a special treat--a movie they have all been wanting to see. She asks if anyone in the class knows how to run a projector, and _______ eagerly raises his hand because he thinks it is like the projector his father has. All the kids laugh and the teacher looks unsure, but he assures her that he knows all about running the machine. But as _______ gets to the machine he realizes that it isn't the same kind as his father's. He is about to admit that he's not sure after all, when he sees all the class and the teacher watching him. Suddenly he knows that he can't fail this time, and he turns and puts the film into the projector. He signals that the film is ready, and the teacher puts out the lights. _______ starts the movie, but even before the picture comes on the screen, there is a horrible sound of clashing metal, a smell of burning film, and the machine stops dead. The film is ripped and the projector is probably broken. _______ knows what everyone must be thinking of him, and he turns to run out of the room.

5b. _______ has always felt she was no good. She has tried very hard to make a good impression on the other kids in the class and on her teacher, but usually they just seem to ignore her. She always seemed to be making stupid mistakes and not understand the work they are doing. _______ has always dreamed that someday she would have a chance to show everyone that she is good at something, too.

One day the teacher brings the school's brand new sewing machine into the room and announces that the girls will have a special treat--a sewing lesson. She asks if anyone in the class knows how to run a sewing machine, and _______ eagerly raises her hand because she thinks it is like the sewing machine her mother has. All the kids laugh and the teacher looks unsure, but she assures her that she knows all about running the machine. But as _______ gets to the machine she realizes that it isn't the same kind as her mother's. She is about to admit that she's not sure after all, when she sees all the class and the teacher watching her. Suddenly she knows that she can't fail this time, and she turns and puts the thread in the sewing machine. She puts the cloth under the needle and starts the machine, but even before she's made one good stitch, there is a horrible sound of ripping cloth, a burning smell, and the machine stops dead. The cloth is ripped and the machine is probably broken. ________ knows what everyone must be thinking of her, and she turns to run out of the room.

The present procedure was the last in the total sequence. The immediately preceding procedure involved the administration of the three subtests of the Wechsler Intelligence Scale for Children. In the case of the WISC, it was quite apparent to the child that he faced an intelligence test, and, hence, the relaxed game-like context distinguishing the earlier procedures no longer applied. We decided to maintain an evaluative test-like set for the administration of the story completion procedure on the assumption that this would enhance the validity of the instrument as an index of denial (defensiveness) regarding failure. It soon became clear, however, that the denial aspect was not the major differentiating feature of the story completions. Rather, these appeared to vary in terms of the presence or absence of certain qualities reflecting a general concept of maturity. Although denial of failure might influence the maturity of a story ending, this did not seem to be the most essential ingredient of the story.

How then did we proceed to measure the maturity of story completions? Basically, we attempted to guage the extent to which the story endings were compatible with the character of the protagonist in the story and the situation in which he was embedded. The criterial questions (on the basis of which scoring for maturity was undertaken) were of the following sort: If the story hero perseveres in the child's story completion, for example, is the degree of perseverance realistic in terms of the story beginning, and does it warrant the success achieved? Are the story's characters accurately perceived by the child, and are they made to behave in a manner consistent with their natures and with the situations which confront them? A rating of 1 was given to stories embodying such qualities, and a rating of 0 to stories lacking them.

Two independent scorers evaluated all of the story completions for maturity, working "blindly" with respect to the identities of the children. With respect to interscorer reliability, there were 604 actual agreements out of a possible total of 755 (5 stories for each of 151 subjects). This yields a scoring reliability figure of 80 per cent. Interscorer discrepancies were resolved by discussion. Turning next to the issue of internal consistency, the present procedure yielded an odd-even reliability coefficient (Spearman-Brown) of .59.

Results and Discussion

With regard to sex differences, the sexes are compared on the personality variables in Table 59. The differences that occur are consistent with previous findings and interpretations: boys lower on anxiety, higher on defensiveness, and higher on extraversion than girls. Relations among the personality variables are presented for each sex in Table 60. In the main, the positive findings are consistent with prior evidence and theoretical expectations. The lack of relationship between maturity of story endings and the defensiveness variables emphasizes that the story-ending variable taps a construct which is quite distinct from defensiveness. It is also of some interest to consider relations between the personality variables described in the present section and the behavior ratings described in section III. The findings are presented in Tables 61 and 62. We note that test anxiety in boys is related to hesitancy, lack of confidence, self-deprecation, and lack of concentration (Table 61). This pattern does not appear strongly for the girls. Correlates in observable behavior also are found in the case of social extraversion and maturity of story endings.

Next we turn to the findings that emerge when personality is viewed as a function of creativity and intelligence. Casting creativity and intelligence in the role of treatment variables is, of course, consistent with the approach taken in previous sections, and therefore we shall adopt this perspective first. Significant findings for anxiety, test anxiety, and defensiveness emerge for the boys (Tables 63 through 65), while no significant effects concerning self-descriptive personality variables emerge for the girls. Of special interest in Table 65 is the very low defensiveness level for boys high in both creativity and intelligence.

With regard to the anxiety and test anxiety findings in Tables 63 and 64, the results seem to suggest a Yerkes-Dodson function. The level of anxiety is lowest for the group that is high in intelligence but low in creativity. Anxiety level is middling for the two groups that are high in creativity, regardless of intelligence level. Finally, anxiety level is highest for the group that is low in intelligence and low in creativity. The allusion to the Yerkes-Dodson law is made since creativity is found to be maximal in the presence of an intermediate level of anxiety. If anxiety is either too low or too high, then creativity is reduced. Just as interesting, however, are the particular conditions under which anxiety level is lowest. It is the group high in intelligence but low in creativity who, by self-report, are least anxious. At the other end of the dimension, with the highest anxiety scores, stands the group low in both intelligence and creativity.

The present findings force us to question whether creativity should be conceptually associated with a state of maximal freedom from anxiety symptoms. It is not those children who are lowest in anxiety level, but those who report a moderate degree of anxiety, whom we find to be most creative in their thinking processes. Traditional conceptions of mental health place considerable emphasis upon anxiety as a debilitator of cognitive performance and as a signal of inappropriate or ineffective adjustment. This no doubt is true when anxiety reaches quite high levels. We need only remember that the strongest degree of anxiety is found in the most cognitively deprived group of children--those who are low both in general intelligence and creativity. However, it may also be the case that a modicum of anxiety is reflecting more the presence of sensitivity to internal states than the presence of disturbance. The data in hand suggest that it is unrealistic to assume that the most creative children are the happiest children. There may well be elements of obsessiveness present in the kind of associative freedom that leads to high creativity status. A playful contemplation of the possible, but also an obsessive, task-centered reluctance to put a problem aside may be involved in the production of many associates and of a large number of unique associates.

It is of interest to consider the group whose levels of general anxiety and of test anxiety are lowest--the group high in intelligence but low in creativity. This result may well stem from the fact that the group in question is the most closely attuned to the demands of the classroom environment. In that environment, traditionally defined intelligence and its manifestations in the form of high academic achievement most likely are heavily rewarded, while creativity may well be viewed as more of a disruption than a boon. The mode of operation of the high intelligence-low creativity child, therefore, may be such as to minimize the sources of possible conflict between himself and the school environment and to maximize the sources of reward from that environment. It is not surprising that such a close fit between individual and social context would be reflected in a minimal level of anxiety.

Turning to the results for maturity of story endings, we find in Tàbles 66 and 67 that the present variable relates to creativity for the boys and to intelligence for the girls. Possibly, high intelligence-low creativity boys perform poorly on this task because the remoteness of failure from their experience and their strong desire for achievement make contemplation of a failure situation particularly intolerable for them. On the other hand, the poor performance of high creativity-low intelligence girls may arise because failure is so familiar to them that the story material is particularly threatening on that account.

Now let us reverse the roles of antecedents and consequents and view creativity and intelligence as a function of personality. Test anxiety and defensiveness were selected to serve as treatment variables, partly on the basis of our earlier success with these variables in other research (Kogan & Wallach, 1964). Joint dichotomizations at the medians resulted in the following cell sizes, which apply for the remaining analyses reported in this section:

	Boys	Girls
Low test anxious-low defensive	12	13
Low test anxious-high defensive	23	28
High test anxious-low defensive	21	26
High test anxious-high defensive	14	14

Tables 68 and 69 present mean summed standard scores on the intelligence cluster and on the creativity cluster respectively, for boys. Tables 70 and 71 present the analogous results for girls. With regard to intelligence, the combination of high test anxiety and high defensiveness depresses intelligence level for both sexes. These are, after all, children who admit to anxiety in test situations despite strong defenses against anxiety. We can well understand, therefore, that the stressful nature of conventional intelligence tests would be most keenly felt by them. With regard to creativity, the combination of high defensiveness and low test anxiety tends to be linked with the lowest creativity levels for both sexes. These are the maximally defensive children, in that they do not admit to test anxiety. The present results, therefore, support the hypothesis of an inverse linkage between creativity and defensiveness, and offer the first such demonstration in a sample of children. The data are stronger, however, for the boys than the girls.

The evidence viewing creativity and intelligence as a function of personality indicates that test anxiety does not especially hamper creativity, and may even help somewhat in the case of the boys. Defensiveness tends to constitute a hindrance to creativity. In regard to intelligence, we have found that while test anxiety as such tends to hinder performance on intelligence tests, this decremental effect is enhanced when defensiveness is also present.

In the remainder of this section we shall consider effects of test anxiety and defensiveness on the measures of categorizing, conceptualizing, and physiognomic sensitivity that were described earlier. Turning first to the band-width measure of categorization breadth, Tables 72 and 73 present the results. The sexes clearly differ: test anxious boys show narrower band-width, while defensive girls show broader band-width. The finding for the boys is consistent with the view that high levels of anxiety can cause reduction in cue utilization. The result for the girls suggests the possibility of a link between defensiveness and an obsessive mode of responding, in which all possible positive exemplars of a class are included within the category boundaries (see Kogan & Wallach, 1964). The only other significant personality effects in the categorizing and conceptualizing domain concern the thematic integration task, where we find (Tables 74 and 75) that defensive children provide a larger number of poor thematic integrations than do children of low defensiveness.

Next we consider relations with physiognomic sensitivity measures. In Table 76 we find a non-significant tendency for defensive boys to adhere to atomistic physical aspects of the stimuli on their free descriptions of stick figures. The evidence for this tendency is strengthened when we note that the correlations for the boys relating defensiveness to number of lows, number of mediums, and number of highs, in stick figure descriptions, are .51, -.01, and -.33, respectively. Thus, an inverse relationship between defensiveness and a measure of physiognomic sensitivity is found for the boys. Tables 77 and 78 indicate that the same measure in the case of the girls does not yield parallel effects. While the free description of paths measure, in turn, yields no differences for either sex, the "matching" procedure produces the results shown in Tables 79 and 80. For the boys, high defensiveness is linked with fewer correct matches. Again, results differ for the girls. Turning finally to the physiognomic procedure involving acceptance or rejection of emotive adjectives as applied to particular stick figures, Table 81 indicates that defensive boys tend to accept fewer moderately appropriate stick-figure attributions than boys who are low in defensiveness.

The clearest finding that emerges from the above materials is the presence of an inverse relationship for boys between defensiveness and physiognomic sensitivity. We also noted earlier an inverse linkage in the case of boys between defensiveness and creativity. Positive relationships, in turn, have been observed between physiognomic sensitivity and creativity. For boys, then, a syndrome emerges in which creativity and physiognomic sensitivity are positively related, creativity and defensiveness are inversely related, and physiognomic sensitivity and defensiveness are inversely related. Thus, the ability to produce unique and plentiful ideational associates shows some relationship with awareness of negative affective states in oneself and with sensitivity to expressive characteristics of visual stimuli that surround one. Common to all of these processes is an "openness" to stimulation of external or internal origin.

VII. ABSTRACT

The present study had two objectives. First, we wished to inquire whether an aspect of cognitive functioning could be isolated that (a) could be appropriately labeled "creativity," and (b) was independent of the traditional concept of general intelligence. Second, if an affirmative answer were forthcoming to the first query, we then wished to study psychological correlates that distinguished individual differences on the creativity and intelligence dimensions taken jointly.

Our review of previous quantitative research suggested that instruments used to assess "creativity" tended to correlate with intelligence at least as strongly as they correlated with each other. Given the heterogeneous array of procedures that had been used in such studies, however, and the fact that all of them had involved an evaluation-centered, test-oriented context for administration of the creativity procedures, we returned to the theoretical issue of just what the concept of creativity seemed to involve psychologically. Introspections of artists and scientists suggested that the major focus of the concept concerns the freedom to produce abundant associative content which also is unique, within a criterion of task relevance. Such introspections also suggested that the conditions under which production of abundant and unique associations occurs tend to involve a playful, permissive attitude where the focus is upon the task, rather than a concern with the implications of one's per-

formance for evaluation of one's self-worth.

This analysis of creativity suggested that we concentrate upon assessment of productivity and uniqueness of associative behavior, and that the context of assessment be game-like and playful, with freedom from the constraint of time limits, rather than a context suggesting that the individual's self-worth is under test. Procedures covering both verbal and visual formats were developed, therefore, and administered to 151 fifth-grade children (70 boys, 81 girls) in a game-like context without time-pressure. These procedures involved the generation of various kinds of associates within given task requirements--such as uses for particular objects, ways in which particular objects are similar, or things that particular patterns might be. Number of associates and number of statistically unique associates (offered by only one child in the sample as a response to the given stimulus) were determined for each of five procedures. Standard intelligence information, in turn, was obtained from an extensive range of tests. The children were of middle-class socioeconomic status.

All creativity variables were substantially ~~[illegible]~~ intercorrelated for the children of each sex, and this also was the case for all intelligence variables. Correlations between the creativity and the intelligence measures, on the other hand, were extremely low. Our first query thus was answered in the affirmative, and we now proceeded to locate each child in one of four groups (within sex) generated by joint consideration of the creativity and intelligence dimensions: high creativity-high intelligence, high creativity-low intelligence, low creativity-high intelligence, and low creativity-low intelligence. The groups were determined by median dichotomizations of index scores for each dimension. Individual differences among these groups then were studied in four main areas of functioning: behavior as observed in school and play settings; categorizing and conceptualizing activities; sensitivity to physiognomic properties of the environment; and personality dispositions indicated through self-description and through fantasy. We shall consider major findings from each of these areas in turn.

Observations of the children in school and play settings were conducted during an initial period of two weeks spent in each classroom by two experimenters. Following the two-week period, ratings were made with regard to various types of behaviors. The ratings were made "blindly" with respect to any other information about the children.

Of particular interest were the findings for the girls. Those high in both creativity and intelligence showed the highest level of self-confidence, the least tendency toward deprecation of oneself and one's work, the strongest tendency to seek out others for companionship, the strongest tendency to be sought by others, the highest levels of attention span and concentration for academic work, but also strong tendencies to engage in disruptive behavior. Those high in creativity but low in intelligence, in contrast, were the most cautious and hesitant of all the groups, the least confident, the most self-deprecatory, the least sought after by others, the least able to concentrate and maintain attention, and in addition they were quite avoidant of others. The one characteristic they shared with the high-high group was the presence of disruptive behavior. Turning next to the group low in both creativity and intelligence, these girls were more confident and self-assured, less hesitant, and more extraverted socially, than were the high creativity-low intelligence girls. Finally, the group of high intelligence but low creativity was least likely to engage in disruptive behavior, was reasonably hesitant about expressing opinions, was sought out socially by others but tended not to seek out others in return, and was high in attention span and concentration. In sum, the high creativity-low intelligence group seems to be the maximally disadvantaged group in the classroom, and the high intelligence-low creativity group seems to be characterized by a basic reserve and an unwillingness to take chances.

Findings concerning how the children code similarities and differences permitted us to amplify some of the points just made. Creativity was associated with a general preference for setting broad category boundaries in the case of concepts already in existence. That is, the creative child was more willing to tolerate deviant instances as possibly deserving membership in a common category. The production of abundant and unique associates thus seems to be related to the seeing of possible connections between disparate events.

When we turn to the question of how children form concepts *de novo*, in contrast to the issue of how they set boundaries in the case of categories that are already formed, the following results were obtained for the boys. A heterogenous array of objects was to be sorted in whatever manner the child wished, and the reasons which he offered for his groupings in response to an inquiry then were systematically content analyzed. The high intelligence-low creativity boys showed a conspicuously low tendency to establish groupings on the basis of relationships or themas among objects. Rather, they concentrated upon sorting objects in terms of common-element abstraction involving inferential characteristics, such as "eating utensils." Groupings based upon themas constitute a rather free-wheeling, unconventional type of response to the given task, in which there is greater free play for evolving unique combinations of stimuli. The one group whose incidence of thematic responding is disproportionately low, therefore, is the group of high intelligence but low creativity. There is, furthermore, evidence that the low incidence of thematizing displayed by this group reflects not an inability to thematize but rather an avoidance of it. When confronted by a task whose instructions required the child to thematize, the high intelligence-low creativity group showed itself capable of doing so. The group in question, then--this time in the case of the boys--seems once more to reflect an unwillingness to take chances and engage in forms of behavior that may involve error.

Consider next some of the results obtained in studying the children's sensitivity to properties of the visual environment that may possess affective or "expressive" connotations--what have been termed "physiognomic" properties. The results from several procedures suggested that both intelligence and creativity could be involved in the making of physiognomic discriminations. Physiognomic sensitivity seemed to depend both upon the capacity to make inferential translations from one mode of experience to another (reflective of intelligence) and upon the range of associational material that could be utilized in making inferential linkages (reflective of creativity). A number of findings were consistent with the additivity which this formulation implies, in that physiognomic sensitivity was maximal for the high intelligence-high creativity group, minimal for the low intelligence-low creativity group, and intermediate for the other two groups. Further findings, however, suggested that the high creativity-low intelligence girls might be avoiding the making of physiognomic discriminations for motivational reasons, in a manner consistent with the general social avoidance that had been evident in their overt behavior.

In a physiognomic procedure which invited the child to entertain the possibility of relatively unconventional emotive attributions for stick figures in various postures, the high intelligence-low creativity girls showed a conspicuously low level of acceptance for these unlikely, "far-out" types of hypotheses. Again, then, the high intelligence-low creativity group--this time among the girls--was found to avoid types of cognitive behavior that might lead to error. Since the groups did not differ in their willingness to entertain likely hypotheses, the finding just described was specific to the entertainment of unlikely emotive hypotheses as such.

Finally, studies concerning self-description and fantasy behavior were conducted. The major results based upon self-report information evaluated individual differences in general anxiety, test anxiety, and defensiveness. For the boys, both anxiety in general and anxiety with respect to tests in particular were minimal in the high intelligence-low creativity group, suggesting that this group may be maximally rewarded and minimally punished within the classroom environment. General anxiety and test anxiety levels were intermediate in the high creativity groups, suggesting that a moderate level of anxiety reflects sensitivity to internal states rather than disturbance. Evidence also was obtained supportive of an inverse relationship between creativity and defensiveness. Maturity of fantasy reactions to described failure-situations, in turn, was found to correlate with creativity for the boys and with intelligence for the girls, indicating that both cognitive dimensions can be reflected in the present maturity concept.

In the case of the boys, further evidence indicated that defensiveness and physiognomic sensitivity were inversely related. Taken in conjunction with findings reported earlier, a syndrome thus emerged in which high creativity was linked both with high physiognomic sensitivity and with low defensiveness. The major characteristic of this syndrome seems to be an "openness" to stimulation of various kinds.

In sum, the present research indicates the importance of studying variations in creativity as here defined and in general intelligence considered jointly, if understanding of creativity is to be furthered. The findings of the research lead us to conclude that the present definition of creativity seems to be a fruitful one.

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Table 1.

Spearman-Brown Split-Half Reliability Coefficients for the Ten Creativity Variables (N=151)

Instances-uniqueness	.51
Instances-number	.75
Alternate uses-uniqueness	.87
Alternate uses-number	.93
Similarities-uniqueness	.87
Similarities-number	.93
Pattern meanings-uniqueness	.88
Pattern meanings-number	.93
Line meanings-uniqueness	.82
Line meanings-number	.93

Table 2.

Item-Sum Correlations for the Instances Procedure (N=151)

Item	Uniqueness	Number
1	.68	.74
2	.73	.67
3	.70	.85
4	.50	.76

Table 3.

Item-Sum Correlations for the Alternate

Uses Procedure (N=151)

Item	Uniqueness	Number
1	.48	.80
2	.59	.79
3	.69	.83
4	.76	.84
5	.83	.86
6	.79	.83
7	.73	.83
8	.73	.84

Table 4.

Item-Sum Correlations for the Similarities Procedure (N=151)

Item	Uniqueness	Number
1	.42	.70
2	.63	.73
3	.67	.78
4	.77	.81
5	.74	.79
6	.66	.81
7	.55	.81
8	.72	.82
9	.75	.85
10	.65	.76

Table 5.

Item-Sum Correlations for the Pattern

Meanings Procedure (N=151)

Item	Uniqueness	Number
1	.64	.74
2	.78	.83
3	.80	.85
4	.69	.83
5	.80	.85
6	.78	.82
7	.75	.75
8	.64	.69

Table 6.

Item-Sum Correlations for the Line Meanings Procedure (N=151)

Item	Uniqueness	Number
1	.59	.68
2	.65	.79
3	.58	.72
4	.67	.77
5	.60	.80
6	.67	.83
7	.66	.79
8	.64	.76
9	.68	.84

Table 7.

Intercorrelations Among the Ten Creativity Measures

for the Total Sample (N=151)

	2.	3.	4.	5.	6.	7.	8.	9.	10.
1. Instances-uniqueness	08	41	24	33	32	27	07	35	20
2. Instances-number		35	45	23	41	27	30	33	42
3. Alternate uses-uniqueness			67	66	70	46	29	44	52
4. Alternate uses-number				53	74	49	39	39	58
5. Similarities-uniqueness					71	32	20	49	46
6. Similarities-number						45	38	52	58
7. Pattern meanings-uniqueness							29	55	50
8. Pattern meanings-number								25	40
9. Line meanings-uniqueness									64
10. Line meanings-number									

Note--For 149 df, r's of .16 and .21 are significant at the .05 and .01 levels, respectively. In Tables 7-15, decimal points are omitted. In order that correlations between the uniqueness and number variables from a given creativity procedure be uncontaminated, the number measures used for computational purposes in Tables 7, 9, 10, 12, 13, 15, and 16, consist of all responses but those that are unique.

Table 8.

Intercorrelations Among the Ten Intelligence Measures

for the Total Sample (N=151)

	2.	3.	4.	5.	6.	7.	8.	9.	10.
1. WISC-vocabulary (V)	18	37	56	38	55	53	59	43	44
2. WISC-picture arrangement (PA)		17	15	16	20	24	24	12	16
3. WISC-block design (BD)			34	34	51	37	38	29	26
4. SCAT-verbal (V)				70	71	71	80	70	77
5. SCAT-quantitative (Q)					71	65	69	74	77
6. STEP-mathematics (M)						67	73	60	65
7. STEP-science (S)							76	71	70
8. STEP-social studies (SS)								71	74
9. STEP-reading (R)									80
10. STEP-writing (W)									

Note--For 149 df, r's of .16 and .21 are significant at the .05 and .01 levels, respectively.

Table 9.

Intercorrelations Between the Ten Creativity and Ten Intelligence Measures for the Total Sample (N=151)

	WISC V	WISC PA	WISC BD	SCAT V	SCAT Q	STEP M	STEP S	STEP SS	STEP R	STEP W
Instances-uniqueness	11	12	02	01	-11	06	00	05	00	-09
Instances-number	09	17	15	06	07	07	20	17	08	09
Alternate uses-uniqueness	14	11	-01	05	03	12	12	10	07	06
Alternate uses-number	13	09	06	16	13	22	15	18	14	16
Similarities-uniqueness	09	12	-03	09	02	09	07	08	01	01
Similarities-number	19	14	02	22	13	23	17	21	11	14
Pattern meanings-uniqueness	11	01	06	12	13	15	13	12	09	15
Pattern meanings-number	-13	12	-03	-01	00	-05	01	-04	-02	05
Line meanings-uniqueness	22	21	11	21	21	17	23	21	17	19
Line meanings-number	03	09	04	11	12	02	07	10	11	10

Note--For 149 df, r's of .16 and .21 are significant at the .05 and .01 levels, respectively.

Table 10.

Intercorrelations Among the Ten Creativity Measures

for the Boys (N=70)

	2.	3.	4.	5.	6.	7.	8.	9.	10.
1. Instances-uniqueness	-10	44	18	32	29	15	-04	23	11
2. Instances-number		25	42	10	41	16	25	26	42
3. Alternate uses-uniqueness			66	73	73	30	25	35	42
4. Alternate uses-number				48	66	47	31	31	54
5. Similarities-uniqueness					68	35	20	43	34
6. Similarities-number						39	31	48	50
7. Pattern meanings-uniqueness							04	50	42
8. Pattern meanings-number								05	22
9. Line meanings-uniqueness									47
10. Line meanings-number									

Note--For 68 df, r's of .24 and .31 are significant at the .05 and .01 levels, respectively.

Table 11.

Intercorrelations Among the Ten Intelligence Measures for the Boys (*N*=70)

	2.	3.	4.	5.	6.	7.	8.	9.	10.
1. WISC-vocabulary (V)	02	37	55	36	51	50	55	39	46
2. WISC-picture arrangement (PA)		03	-08	20	05	18	16	03	06
3. WISC-block design (BD)			38	48	60	42	38	38	36
4. SCAT-verbal (V)				71	72	69	82	71	75
5. SCAT-quantitative (Q)					75	68	74	78	76
6. STEP-mathematics (M)						68	78	64	72
7. STEP-science (S)							80	69	69
8. STEP-social studies (SS)								70	76
9. STEP-reading (R)									76
10. STEP-writing (W)									

Note--For 68 *df*, *r*'s of .24 and .31 are significant at the .05 and .01 levels, respectively.

Table 12.

Intercorrelations Between the Ten Creativity and Ten Intelligence Measures for the Boys (N=70)

	WISC V	WISC PA	WISC BD	SCAT V	SCAT Q	STEP M	STEP S	STEP SS	STEP R	STEP W
Instances-uniqueness	05	00	-11	-06	-10	01	-03	-04	11	-03
Instances-number	15	21	19	12	06	07	29	15	08	16
Alternate uses-uniqueness	10	12	00	00	-12	04	07	-01	01	08
Alternate uses-number	05	07	13	20	04	19	10	09	10	27
Similarities-uniqueness	06	12	00	07	-03	09	06	06	04	09
Similarities-number	13	08	01	14	-08	15	11	10	00	11
Pattern meanings-uniqueness	17	-08	02	24	14	23	14	17	19	36
Pattern meanings-number	-20	18	-14	-12	-17	-22	-10	-21	-13	-08
Line meanings-uniqueness	20	27	-01	06	09	10	18	12	09	11
Line meanings-number	-05	10	-12	-03	-07	-12	-03	-07	02	-01

Note--For 68 df, r's of .24 and .31 are significant at the .05 and .01 levels, respectively.

Table 13.

Intercorrelations Among the Ten Creativity Measures

for the Girls (N=81)

	2.	3.	4.	5.	6.	7.	8.	9.	10.
1. Instances-uniqueness	31	43	33	41	43	44	38	57	42
2. Instances-number		43	48	34	41	35	38	37	44
3. Alternate uses-uniqueness			68	59	69	61	35	52	62
4. Alternate uses-number				58	80	51	50	44	63
5. Similarities-uniqueness					76	30	21	54	58
6. Similarities-number						49	48	55	64
7. Pattern meanings-uniqueness							59	58	57
8. Pattern meanings-number								49	59
9. Line meanings-uniqueness									74
10. Line meanings-number									

Note--For 79 df, r's of .22 and .29 are significant at the .05 and .01 levels, respectively.

Table 14.

Intercorrelations Among the Ten Intelligence Measures for the Girls (*N*=81)

	2.	3.	4.	5.	6.	7.	8.	9.	10.
1. WISC-vocabulary (V)	28	31	60	51	58	60	65	57	57
2. WISC-picture arrangement (PA)		24	32	18	29	31	29	22	27
3. WISC-block design (BD)			33	33	40	34	39	29	30
4. SCAT-verbal (V)				73	72	75	78	72	82
5. SCAT-quantitative (Q)					77	67	69	70	76
6. STEP-mathematics (M)						69	68	65	71
7. STEP-science (S)							73	77	77
8. STEP-social studies (SS)								75	77
9. STEP-reading (R)									83
10. STEP-writing (W)									

Note--For 79 *df*, *r*'s of .22 and .29 are significant at the .05 and .01 levels, respectively.

Table 15.

Intercorrelations Between the Ten Creativity and Ten Intelligence Measures for the Girls (*N*=81)

	WISC V	WISC PA	WISC BD	SCAT V	SCAT Q	STEP M	STEP S	STEP SS	STEP R	STEP W
Instances-uniqueness	02	19	00	10	03	-00	07	16	02	05
Instances-number	04	14	12	01	09	08	10	19	09	05
Alternate uses-uniqueness	18	10	-03	09	19	18	18	21	15	06
Alternate uses-number	19	11	-00	13	21	24	20	26	20	10
Similarities-uniqueness	11	12	-06	11	07	09	09	10	-02	-06
Similarities-number	25	18	03	28	29	31	25	31	19	18
Pattern meanings-uniqueness	05	06	07	02	14	07	12	07	02	-00
Pattern meanings-number	01	10	14	14	17	20	18	18	09	16
Line meanings-uniqueness	24	17	20	32	30	23	30	29	24	25
Line meanings-number	12	09	16	20	21	13	16	22	14	12

Note--For 79 *df*, *r*'s of .22 and .29 are significant at the .05 and .01 levels, respectively.

Table 10.

Average Intercorrelations Among Creativity Measures, Among Intelligence Measures, and Between Creativity and Intelligence Measures

	Total Sample (*N*=151)	Boys (*N*=70)	Girls (*N*=81)
Among creativity measures (*n*=45 *r*'s)	.41	.34	.50
Among intelligence measures (*n*=45 *r*'s)	.51	.50	.55
Between creativity and intelligence measures (*n*=100 *r*'s)	.09	.05	.13

Table 17.

Sex Comparisons on the Ten Creativity Variables

Variable	Boys (N=70) Mean	Boys (N=70) SD	Girls (N=81) Mean	Girls (N=81) SD	t	p
Instances-uniqueness	6.36	3.91	3.70	2.70	4.90	<.01
Instances-number	45.13	7.44	42.31	8.22	2.20	<.05
Alternate uses-uniqueness	10.29	9.48	9.67	8.71	0.42	n.s.
Alternate uses-number	46.73	19.54	45.42	20.18	0.40	n.s.
Similarities-uniqueness	4.80	6.40	4.59	5.65	0.21	n.s.
Similarities-number	45.47	18.99	45.52	19.96	0.01	n.s.
Pattern-meanings-uniqueness	12.49	9.36	11.88	9.94	0.39	n.s.
Pattern-meanings-number	34.60	14.33	35.37	15.41	0.32	n.s.
Line meanings-uniqueness	7.89	6.08	7.91	7.06	0.03	n.s.
Line meanings-number	38.06	13.91	40.86	20.38	0.97	n.s.

Table 18.

Sex Comparisons on the Ten Intelligence Variables

Variable	Boys (N=70)		Girls (N=81)			
	Mean	SD	Mean	SD	t	p
WISC-vocabulary	43.59	6.53	41.23	5.56	2.39	<.02
WISC-picture arrangement	31.00	5.28	29.86	6.69	1.14	n.s.
WISC-block design	32.71	9.93	28.60	10.32	2.48	<.02
SCAT-verbal	256.74	11.43	256.64	10.72	0.06	n.s.
SCAT-quantitative	256.17	8.70	259.70	9.18	2.42	<.02
STEP-mathematics	255.21	10.65	252.04	10.21	1.87	n.s.
STEP-science	263.09	12.91	263.42	9.57	0.18	n.s.
STEP-social studies	257.91	11.82	257.46	11.00	0.25	n.s.
STEP-reading	262.97	16.48	268.30	14.97	2.08	<.05
STEP-writing	259.19	15.86	267.04	16.05	3.01	<.01

Table 19.

Sex Comparisons on the Creativity and Intelligence Index Scores

	Boys (N=70)		Girls (N=81)			
	Mean	SD	Mean	SD	t	p
Creativity index score	0.60	6.93	-0.52	7.89	0.91	n.s.
Intelligence index score	0.05	7.61	-0.04	7.41	0.07	n.s.

Table 20.

Sample Sizes for Groups of Boys High and Low in Creativity and Intelligence

		Intelligence	
		High	Low
Creativity	High	*N* = 17	*N* = 18
	Low	*N* = 18	*N* = 17

Table 21.

Sample Sizes for Groups of Girls High and Low

in Creativity and Intelligence

		Intelligence	
		High	Low
Creativity	High	N = 22	N = 18
	Low	N = 19	N = 22

Table 22.

Mean Ages of the Four Groups of Boys (N=70)

		Intelligence	
		High	Low
Creativity	High	10 yr., 7.88 mo. (5.29 mo.)	10 yr., 8.33 mo. (5.94 mo.)
	Low	10 yr., 7.28 mo. (5.14 mo.)	10 yr., 9.24 mo. (7.73 mo.)

Analysis of Variance

Source	df	MS	F	p
Intelligence	1	1.45	<1.00	n.s.
Creativity	1	0.02	<1.00	n.s.
Interaction	1	0.57	<1.00	n.s.
Within Cells	66	2.13		

Note--In this and all subsequent 2 x 2 tables, standard deviations appear in parentheses.

Table 23.

Mean Ages of the Four Groups of Girls (N=81)

		Intelligence	
		High	Low
Creativity	High	10 yr., 7.50 mo. (5.60 mo.)	10 yr., 5.61 mo. (4.79 mo.)
	Low	10 yr., 6.84 mo. (3.35 mo.)	10 yr., 8.14 mo. (4.83 mo.)

Analysis of Variance

Source	df	MS	F	p
Intelligence	1	0.09	<1.00	n.s.
Creativity	1	0.87	<1.00	n.s.
Interaction	1	2.53	2.17	n.s.
Within Cells	77	1.17		

Table 24.

Interjudge Reliability Data for the Behavior Rating Scales

		Scales								
		A	B	C	D	E	F	G	H	I
Interjudge discrepancy	0	33	35	38	39	29	54	32	63	49
	1	61	55	61	63	59	51	39	51	62
	2	34	39	25	36	35	28	41	25	28
	3	12	12	19	12	14	10	11	9	7
	4	11	7	8	1	10	5	16	2	2
	5	0	3	0	0	4	2	4	1	2
	6	0	0	0	0	0	1	7	0	1
	7	0	0	0	0	0	0	1	0	0
	8	0	0	0	0	0	0	0	0	0
Intraclass correlation	(R)	.68	.67	.55	.68	.43	.62	.10	.78	.72

Table 25.

Sex Comparisons on the Behavior Rating Scales

	Boys (N=70)		Girls (N=81)			
Dimension	Mean	SD	Mean	SD	t	p
A. Attention-seeking	4.51	2.26	3.36	1.84	3.46	<.001
B. Hesitant and subdued	4.03	2.07	5.23	1.91	3.72	<.001
C. Confidence and assurance	4.99	1.66	4.58	1.73	1.46	n.s.
D. Sought as companion	4.76	1.75	4.84	1.74	0.29	n.s.
E. Seeks companionship	6.16	1.45	5.70	1.66	1.77	n.s.
F. Deprecates own work	3.80	1.62	4.23	1.83	1.54	n.s.
H. Concentration on schoolwork	5.67	2.22	5.74	2.06	0.20	n.s.
I. Interest in schoolwork	5.50	2.08	5.28	1.95	0.66	n.s.

Table 26.

Intercorrelations among Behavior Rating Scales

	A	B	C	D	E	F	H	I
A. Attention-seeking	--	-42	-06	-01	67	-06	-23	01
B. Hesitant and subdued	-66	--	-53	-30	-29	67	-53	-69
C. Confidence and assurance	36	-68	--	52	06	-57	61	63
D. Sought as companion	32	-46	68	--	39	-40	35	42
E. Seeks companionship	56	-44	43	72	--	-04	-16	04
F. Deprecates own work	-25	66	-66	-47	-25	--	-27	-25
H. Concentration on schoolwork	03	-48	58	40	15	-35	--	91
I. Interest in schoolwork	15	-59	55	41	24	-37	91	--

Note--Correlations for boys (N=70) appear above diagonal; correlations for girls (N=81) appear below diagonal. For the boys, r's of .24 and .31 are significant beyond the .05 and .01 levels, respectively. For the girls, the corresponding r's are .22 and .29.

Decimal points are omitted.

Table 27.

Mean Ratings on Dimension A (Attention-seeking) for the Four Groups of Girls (*N*=81)

		Intelligence	
		High	Low
Creativity	High	4.05 (1.81)	3.44 (1.85)
	Low	2.74 (1.94)	3.14 (1.64)

Analysis of Variance

Source	*df*	*MS*	*F*	*p*
Intelligence	1	0.01	<1.00	n.s.
Creativity	1	0.65	4.02	<.05
Interaction	1	0.25	1.54	n.s.
Within Cells	77	0.16		

Table 28.

Mean Ratings on Dimension B (Hesitant and Subdued) for the Four Groups of Boys (N=70)

		Intelligence	
		High	Low
Creativity	High	3.12 (1.93)	4.67 (1.94)
	Low	3.67 (1.91)	4.65 (2.23)

Analysis of Variance

Source	df	MS	F	p
Intelligence	1	1.60	6.95	$<.02$
Creativity	1	0.07	<1.00	n.s.
Interaction	1	0.08	<1.00	n.s.
Within Cells	66	0.23		

Table 29.

Mean Ratings on Dimension B (Hesitant and Subdued)

for the Four Groups of Girls (N=81)

		Intelligence	
		High	Low
Creativity	High	3.86 (1.93)	6.06 (1.59)
	Low	5.37 (2.03)	5.82 (1.26)

Analysis of Variance

Source	df	MS	F	p
Intelligence	1	1.74	11.77	<.01
Creativity	1	0.40	2.71	n.s.
Interaction	1	0.76	5.12	<.04
Within Cells	77	0.15		

Table 30.

Mean Ratings on Dimension C (Confidence and Assurance) for the Four Groups of Girls (N=81)

		Intelligence	
		High	Low
Creativity	High	5.55 (1.92)	3.33 (1.50)
	Low	5.11 (1.49)	4.18 (1.14)

Analysis of Variance

Source	df	MS	F	p
Intelligence	1	2.46	20.83	<.01
Creativity	1	0.04	<1.00	n.s.
Interaction	1	0.42	3.52	<.07
Within Cells	77	0.12		

Table 31.

Mean Ratings on Dimension D (Sought as Companion) for the Four Groups of Girls (*N*=81)

		Intelligence	
		High	Low
Creativity	High	5.64 (1.36)	3.83 (1.98)
	Low	5.11 (2.05)	4.64 (1.09)

Analysis of Variance

Source	*df*	*MS*	*F*	*p*
Intelligence	1	1.29	9.67	< .01
Creativity	1	0.02	< 1.00	n.s.
Interaction	1	0.45	3.33	< .08
Within Cells	77	0.13		

Table 32.

Mean Ratings on Dimension E (Seeks Companionship) for the Four Groups of Girls (N=81)

		Intelligence	
		High	Low
Creativity	High	6.32 (1.29)	5.17 (2.18)
	Low	5.05 (1.62)	6.09 (1.27)

Analysis of Variance

Source	df	MS	F	p
Intelligence	1	0.00	<1.00	n.s.
Creativity	1	0.03	<1.00	n.s.
Interaction	1	1.20	9.46	<.01
Within Cells	77	0.13		

Table 33.

Mean Ratings on Dimension F (Deprecates Own Work) for the Four Groups of Boys (*N*=70)

		Intelligence	
		High	Low
Creativity	High	2.76 (1.72)	4.61 (1.20)
	Low	3.50 (1.79)	4.29 (1.10)

Analysis of Variance

Source	*df*	*MS*	*F*	*p*
Intelligence	1	1.74	13.83	<.01
Creativity	1	0.04	<1.00	n.s.
Interaction	1	0.28	2.20	n.s.
Within Cells	66	0.13		

Table 34.

Mean Ratings on Dimension F (Deprecates Own Work)

for the Four Groups of Girls (N=81)

		Intelligence	
		High	Low
Creativity	High	3.14 (1.81)	5.28 (1.93)
	Low	3.79 (1.55)	4.86 (1.25)

Analysis of Variance

Source	df	MS	F	p
Intelligence	1	2.59	19.23	<.01
Creativity	1	0.01	<1.00	n.s.
Interaction	1	0.28	2.12	n.s.
Within Cells	77	0.13		

Table 35.

Mean Ratings on Dimension H (Concentration on Schoolwork) for the Four Groups of Boys (N=70)

		Intelligence	
		High	Low
Creativity	High	7.12 (1.87)	5.11 (2.35)
	Low	6.28 (1.87)	4.18 (1.67)

Analysis of Variance

Source	df	MS	F	p
Intelligence	1	4.22	19.19	<.01
Creativity	1	0.79	3.58	<.07
Interaction	1	0.00	<1.00	n.s.
Within Cells	66	0.22		

Table 36.

Mean Ratings on Dimension H (Concentration on Schoolwork) for the Four Groups of Girls (*N*=81)

		Intelligence	
		High	Low
Creativity	High	7.45 (1.37)	4.11 (1.64)
	Low	6.89 (1.24)	4.36 (1.50)

Analysis of Variance

Source	*df*	*MS*	*F*	*p*
Intelligence	1	8.63	83.36	<.01
Creativity	1	0.02	<1.00	n.s.
Interaction	1	0.17	1.59	n.s.
Within Cells	77	0.10		

Table 37.

Mean Ratings on Dimension I (Interest in Schoolwork)

for the Four Groups of Boys (N=70)

		Intelligence	
		High	Low
Creativity	High	6.82 (2.04)	4.72 (1.87)
	Low	6.06 (2.07)	4.41 (1.46)

Analysis of Variance

Source	df	MS	F	p
Intelligence	1	3.51	17.36	<.01
Creativity	1	0.29	1.44	n.s.
Interaction	1	0.05	<1.00	n.s.
Within Cells	66	0.20		

Table 38.

Mean Ratings on Dimension I (Interest in Schoolwork)

for the Four Groups of Girls (*N*=81)

		Intelligence	
		High	Low
Creativity	High	6.77 (1.38)	3.78 (1.86)
	Low	6.16 (1.30)	4.27 (1.52)

Analysis of Variance

Source	*df*	*MS*	*F*	*p*
Intelligence	1	5.95	51.77	<.01
Creativity	1	0.00	<1.00	n.s.
Interaction	1	0.31	2.68	n.s.
Within Cells	77	0.12		

Table 39.

Sex Differences in Categorizing and Conceptualizing

Variable	Boys (N=70) Mean	Boys (N=70) SD	Girls (N=81) Mean	Girls (N=81) SD	t	p
Band Width	44.94	10.68	39.72	11.15	2.93	<.01
Object Sorting						
No. of groups	12.01	4.01	12.21	3.15	0.34	n.s.
No. of singles	3.59	4.50	2.85	3.15	1.17	n.s.
% Descriptive	20.41	17.57	14.85	12.55	2.26	<.05
% Inferential	56.13	19.35	59.79	20.26	1.13	n.s.
% Relational	23.41	14.41	25.42	19.57	0.71	n.s.
Thematic Integration						
No. of 0-type stories	0.30	0.82	0.28	0.60	0.14	n.s.
No. of 1-type stories	3.59	1.49	3.63	1.29	0.19	n.s.
No. of 2-type stories	1.11	1.40	1.09	1.32	0.13	n.s.

Table 40.

Correlations between Variables in the Categorizing and Conceptualizing Domains

Variable	1.	2a.	2b.	3a.	3b.	3c.	4a.	4b.	4c.
1. Band-width	--	-20	10	06	-03	-04	-15	02	07
2a. No. of groups	-07	--	14	-08	05	04	-07	-23	28
2b. No. of singles	-17	31	--	-10	13	-07	36	-19	-01
3a. % descriptive	03	35	19	--	-70	-29	08	05	-10
3b. % inferential	-20	-46	-03	-37	--	-49	-11	09	-03
3c. % relational	19	26	-09	-26	-80	--	05	-18	16
4a. No. of 0-type stories	-18	-01	-06	-12	12	-05	--	-38	-18
4b. No. of 1-type stories	15	-16	23	24	-06	-09	-19	--	-84
4c. No, of 2-type stories	-07	16	-20	-18	00	11	-27	-90	--

Note--Boys (N=70) are above diagonal; girls (N=81) are below diagonal. Correlations enclosed within blocks involve relations between experimentally dependent measures. For boys, r's of .24 and .31 are significant at the .05 and .01 levels, respectively. For the girls, the corresponding r's are .22 and .29.

are

Decimal points omitted.

Table 41.

Mean Band-Width Scores for

the Four Groups of Boys (_N_=70)

		Intelligence	
		High	Low
Creativity	High	46.59 (10.95)	47.61 (10.01)
	Low	46.22 (11.35)	39.12 (8.94)

Analysis of Variance

Source	df	MS	F	p
Intelligence	1	9.25	1.50	n.s.
Creativity	1	19.62	3.19	<.08
Interaction	1	16.51	2.69	n.s.
Within Cells	66	6.15		

Table 42.

Mean Band-Width Scores for the Four Groups of Girls (N=81)

		Intelligence High	Intelligence Low
Creativity	High	41.73 (10.88)	43.11 (12.49)
	Low	37.74 (9.43)	36.64 (11.18)

Analysis of Variance

Source	df	MS	F	p
Intelligence	1	0.02	<1.00	n.s.
Creativity	1	27.38	4.52	<.05
Interaction	1	1.54	<1.00	n.s.
Within Cells	77	6.05		

Table 43.

Mean Conceptual Differentiation Scores (No. of Groups Excluding Singles) for the Four Groups of Boys (N=70)

		Intelligence	
		High	Low
Creativity	High	13.18 (3.91)	10.94 (4.61)
	Low	10.89 (3.55)	13.18 (3.54)

Analysis of Variance

Source	df	MS	F	p
Intelligence	1	0.00	<1.00	n.s.
Creativity	1	0.00	<1.00	n.s.
Interaction	1	5.11	5.78	$<.03$
Within Cells	66	0.88		

Table 44.

Mean Percentage of Relational Responses for the Four Groups of Boys (N=70)

		Intelligence	
		High	Low
Creativity	High	28.18 (18.37)	23.50 (15.51)
	Low	15.44 (10.52)	27.00 (8.71)

Analysis of Variance

Source	df	MS	F	p
Intelligence	1	11.83	1.08	n.s.
Creativity	1	21.31	1.95	n.s.
Interaction	1	65.87	6.04	$<.02$
Within Cells	66	10.91		

Table 45.

Mean Percentage of Inferential Responses for

the Four Groups of Boys (N=70)

		Intelligence	
		High	Low
Creativity	High	56.12 (19.16)	54.72 (20.93)
	Low	63.50 (19.77)	49.82 (16.14)

Analysis of Variance

Source	df	MS	F	p
Intelligence	1	56.79	2.71	$<.11$
Creativity	1	1.54	<1.00	n. s.
Interaction	1	37.71	1.80	n. s.
Within Cells	66	20.92		

Table 46.

Mean Number of High Quality Stories (2-type) for

the Four Groups of Boys (N=70)

		Intelligence	
		High	Low
Creativity	High	1.41 (1.62)	0.94 (1.26)
	Low	1.44 (1.46)	0.65 (1.17)

Analysis of Variance

Source	df	MS	F	p
Intelligence	1	0.40	3.62	<.07
Creativity	1	0.02	<1.00	n.s.
Interaction	1	0.03	<1.00	n.s.
Within Cells	66	0.11		

Table 47.

Mean Number of Low Quality Stories (0-type) for the Four Groups of Girls (N=81)

		Intelligence	
		High	Low
Creativity	High	0.18 (0.39)	0.00 (0.00)
	Low	0.16 (0.37)	0.73 (0.88)

Analysis of Variance

Source	df	MS	F	p
Intelligence	1	0.04	2.63	n.s.
Creativity	1	0.12	8.65	<.01
Interaction	1	0.14	9.87	<.01
Within Cells	77	0.01		

Table 48.

Spearman-Brown Split-Half Reliability Coefficients

for the Physiognomic Sensitivity Measures

(N=151)

1.	Free descriptions of stick figures	.92
2.	Free descriptions of paths	.55
3.	Emotive connotations of abstract patterns	.58
4a.	Bizarre emotive attributions for stick figures	.40
4b.	Highly appropriate emotive attributions for stick figures	.37
4c.	Moderately appropriate emotive attributions for stick figures	.60

Table 49.

Sex Comparisons on the Physiognomic Sensitivity Measures

Measure	Boys (N=70) Mean	Boys (N=70) SD	Girls (N=81) Mean	Girls (N=81) SD	t	p
1a. Free descriptions of stick figures: lows	1.60	4.07	0.93	2.99	1.17	n. s.
1b. Free descriptions of stick figures: mediums	21.44	5.25	20.91	5.62	0.59	n. s.
1c. Free descriptions of stick figures: highs	11.23	6.05	12.48	6.38	1.23	n. s.
2. Free descriptions of paths	3.09	2.52	4.40	2.81	2.99	<.01
3. Emotive connotations of abstract patterns	19.69	2.41	19.02	2.85	1.53	n. s.
4a. Bizarre emotive attributions for stick figures	0.96	1.21	1.01	1.04	0.30	n. s.
4b. Highly appropriate emotive attributions for stick figures	21.66	1.82	21.54	1.53	0.42	n. s.
4c. Moderately appropriate emotive attributions for stick figures	18.73	2.90	19.07	2.74	0.75	n. s.

Table 50.

Intercorrelations among Physiognomic Sensitivity Measures

	1a.	1b.	1c.	2.	3.	4a.	4b.	4c.
1a. Free descriptions of stick figures: lows	--	-13	-51	-11	16	-01	-07	-13
1b. Free descriptions of stick figures: mediums	03	--	-73	-17	-05	07	-15	01
1c. Free descriptions of stick figures: highs	-47	-84	--	20	-03	-05	20	05
2. Free descriptions of paths	-04	-01	11	--	10	-09	33	15
3. Emotive connotations of abstract patterns	-17	04	08	20	--	-03	07	13
4a. Bizarre emotive attributions for stick figures	-09	00	07	-12	-02	--	-05	21
4b. Highly appropriate emotive attributions for stick figures	-23	-17	24	-04	04	00	--	35
4c. Moderately appropriate emotive attributions for stick figures	-09	-03	13	-01	-06	17	50	--

Note--Correlations for boys (N=70) appear above diagonal; correlations for girls (N=81) appear below diagonal. For the boys, r's of .24 and .31 are significant beyond the .05 and .01 levels, respectively. For the girls, the corresponding r's are .22 and .29. Correlations within block involve relations between experimentally dependent measures.

Decimal points are omitted.

Table 51.

Mean Number of Mediums in Free Descriptions of the Stick Figures by the Four Groups of Boys (N=70)

		Intelligence	
		High	Low
Creativity	High	19.65 (6.02)	20.06 (5.73)
	Low	22.72 (4.07)	23.35 (4.33)

Analysis of Variance

Source	df	MS	F	p
Intelligence	1	0.27	<1.00	n.s.
Creativity	1	10.15	6.81	$<.02$
Interaction	1	0.01	<1.00	n.s.
Within Cells	66	1.49		

Table 52.

Mean Number of Highs in Free Descriptions of the Stick Figures by the Four Groups of Boys (*N*=70)

		Intelligence	
		High	Low
	High	13.53 (7.02)	11.78 (6.14)
Creativity			
	Low	10.33 (6.33)	9.29 (3.85)

Analysis of Variance

Source	*df*	*MS*	*F*	*p*
Intelligence	1	1.95	<1.00	n.s.
Creativity	1	8.06	3.96	<.06
Interaction	1	0.13	<1.00	n.s.
Within Cells	66	2.04		

Table 53.

Mean Number of Lows in Free Descriptions of the Stick Figures by the Four Groups of Girls ($\underline{N}$=81)

		Intelligence	
		High	Low
Creativity	High	0.05 (0.21)	1.78 (3.95)
	Low	1.42 (3.55)	0.68 (2.98)

Analysis of Variance

Source	df	MS	F	p
Intelligence	1	0.25	<1.00	n.s.
Creativity	1	0.02	<1.00	n.s.
Interaction	1	1.53	3.48	<.07
Within Cells	77	0.44		

Table 54.

Mean Number of Highs in Free Descriptions of the Stick Figures by the Four Groups of Girls (*N*=81)

		Intelligence	
		High	**Low**
Creativity	**High**	**15.59** **(6.84)**	**11.11** **(5.82)**
	Low	**12.42** **(7.15)**	**10.55** **(4.64)**

Analysis of Variance

Source	***df***	***MS***	***F***	***p***
Intelligence	**1**	**10.10**	**5.33**	**$<.03$**
Creativity	**1**	**3.49**	**1.84**	**n.s.**
Interaction	**1**	**1.70**	**<1.00**	**n.s.**
Within Cells	**77**	**1.89**		

Table 55.

Mean Number of Highs in Free Descriptions of

Paths by the Four Groups of Boys (N=70)

		Intelligence	
		High	Low
Creativity	High	3.82 (2.79)	3.11 (2.35)
	Low	3.50 (2.85)	1.88 (1.65)

Analysis of Variance

Source	df	MS	F	p
Intelligence	1	1.36	3.91	$<.06$
Creativity	1	0.60	1.74	n.s.
Interaction	1	0.20	<1.00	n.s.
Within Cells	66	0.35		

Table 56.

Mean Number of Highs in Free Descriptions of Paths by the Four Groups of Girls (N=81)

		Intelligence	
		High	Low
Creativity	High	5.64 (3.05)	3.50 (2.09)
	Low	4.74 (2.84)	3.59 (2.70)

Analysis of Variance

Source	df	MS	F	p
Intelligence	1	2.69	7.33	<.01
Creativity	1	0.16	<1.00	n.s.
Interaction	1	0.25	<1.00	n.s.
Within Cells	77	0.37		

Table 57.

Mean Number of Correct Abstract Pattern Choices

by the Four Groups of Boys (N=70)

		Intelligence	
		High	Low
Creativity	High	20.29 (1.83)	20.56 (1.34)
	Low	20.06 (2.48)	17.76 (2.80)

Analysis of Variance

Source	df	MS	F	p
Intelligence	1	1.03	3.78	<.06
Creativity	1	2.29	8.43	<.01
Interaction	1	1.63	5.99	<.03
Within Cells	66	0.27		

Table 58.

Mean Number of Bizarre Emotive Attributions for Stick Figures by the Four Groups of Girls (N=81)

		Intelligence	
		High	Low
Creativity	High	1.14 (1.21)	1.11 (0.90)
	Low	0.42 (0.84)	1.32 (0.99)

Analysis of Variance

Source	df	MS	F	p
Intelligence	1	0.19	3.78	<.06
Creativity	1	0.06	1.28	n.s.
Interaction	1	0.21	4.23	<.05
Within Cells	77	0.05		

Table 59.

Sex Comparisons for Personality Variables

Variable	Boys (N=70)		Girls (N=81)			
	Mean	SD	Mean	SD	t	p
General ~~A~~anxiety	5.31	4.55	7.15	4.54	2.47	<.05
Test ~~A~~anxiety	5.37	4.43	5.79	4.89	0.55	n.s.
Defensiveness	5.69	3.81	4.52	3.40	1.99	<.05
Test defensiveness	1.96	1.46	1.59	1.70	1.40	n.s.
Social extraversion	5.07	1.71	4.46	1.70	2.21	<.05
Maturity of story endings	0.80	0.96	1.05	1.31	1.32	n.s.

Table 60.

Correlations between Personality Variables

	GA	TA	D	TD	SE	MSE
General anxiety (GA)	--	61	-24	-09	13	-19
Test anxiety (TA)	59	--	-18	-17	-11	-11
Defensiveness (D)	-32	-25	--	23	10	-17
Test defensiveness (TD)	-21	-37	41	--	09	03
Social extraversion (SE)	-10	-22	28	30	--	05
Maturity of story endings (MSE)	-27	-16	-01	-06	10	--

Note--Correlations for boys (*N*=70) and for girls (*N*=81) are above and below diagonal, respectively.

Significance at the .05 and .01 levels requires *r*'s of .24 and .31, respectively, for boys, and *r*'s of .22 and .29, respectively, for girls.

Decimal points are omitted.

Table 61.

Correlations for Boys between Personality Variables and Behavior Ratings

	GA	TA	D	TD	SE	MSE
A. Attention-seeking	16	00	01	14	10	-22
B. Hesitant and subdued	-10	33	12	-21	-39	-19
C. Confidence and assurance	-11	-31	-03	04	23	29
D. Sought as companion	-12	-24	-14	-13	19	21
E. Seeks companionship	07	05	-06	-05	16	-10
F. Deprecates own work	21	52	14	-09	-18	-35
H. Concentration on schoolwork	-22	-49	-08	-01	08	37
I. Interest in schoolwork	-14	-44	-12	-03	18	36

Note--For N=70, r's of .24 and .31 are required for significance at the .05 and .01 levels, respectively.

Decimal points are omitted.

Table 62.

Correlations for Girls between Personality Variables and Behavior Ratings

	GA	TA	D	TD	SE	MSE
A. Attention-seeking	03	18	-11	-19	07	03
B. Hesitant and subdued	01	10	06	-01	-28	-12
C. Confidence and assurance	-07	-09	-03	-02	18	27
D. Sought as companion	-06	03	00	-12	22	25
E. Seeks companionship	15	23	-06	-14	23	00
F. Deprecates own work	10	28	-06	-15	-19	-20
H. Concentration on schoolwork	-03	-16	-15	09	-09	21
I. Interest in schoolwork	-07	-21	-11	12	10	15

Note--For N=81, r's of .22 and .29 are required for significance at the .05 and .01 levels, respectively.

Decimal points are omitted.

Table 63.

Mean General Anxiety Scores for the Four Groups of Boys (N=70)

		Intelligence	
		High	Low
Creativity	High	5.41 (3.30)	5.33 (5.10)
	Low	3.22 (3.41)	7.41 (5.36)

Analysis of Variance

Source	df	MS	F	p
Intelligence	1	4.23	3.83	<.06
Creativity	1	0.00	<1.00	n.s.
Interaction	1	4.55	4.13	<.05
Within Cells	66	1.10		

Table 64.

Mean Test Anxiety Scores for

the Four Groups of Boys (N=70)

		Intelligence	
		High	Low
Creativity	High	4.65 (3.37)	5.83 (4.69)
	Low	3.06 (2.65)	8.06 (5.29)

Analysis of Variance

Source	df	MS	F	p
Intelligence	1	9.58	9.85	<.01
Creativity	1	0.10	<1.00	n.s.
Interaction	1	3.64	3.75	<.06
Within Cells	66	0.97		

Table 65.

Mean Defensiveness Scores for

the Four Groups of Boys (N=70)

		Intelligence	
		High	Low
Creativity	High	3.76 (2.61)	6.78 (4.51)
	Low	5.72 (3.58)	6.41 (3.86)

Analysis of Variance

Source	df	MS	F	p
Intelligence	1	3.43	4.35	$<.05$
Creativity	1	0.63	<1.00	n.s.
Interaction	1	1.35	1.71	n.s.
Within Cells	66	0.79		

Table 66.

Mean Score on "Maturity of Story Endings" for the Four Groups of Boys (N=70)

		Intelligence	
		High	Low
Creativity	High	1.18 (1.29)	0.83 (0.86)
	Low	0.61 (0.85)	0.59 (0.71)

Analysis of Variance

Source	df	MS	F	p
Intelligence	1	0.03	<1.00	n.s.
Creativity	1	0.16	3.19	$<.08$
Interaction	1	0.03	<1.00	n.s.
Within Cells	66	0.05		

Table 67.

Mean Score on "Maturity of Story Endings" for the Four Groups of Girls (N=81)

		Intelligence	
		High	Low
Creativity	High	1.41 (1.74)	0.50 (0.62)
	Low	1.47 (1.26)	0.77 (1.11)

Analysis of Variance

Source	df	MS	F	p
Intelligence	1	0.65	8.06	$<.01$
Creativity	1	0.03	<1.00	n.s.
Interaction	1	0.01	<1.00	n.s.
Within Cells	77	0.08		

Table 68.

Mean Intelligence (in Summed Standard Scores) for Test Anxiety and Defensiveness Subgroups (*N*=70 boys)

		Defensiveness	
		Low	High
Test Anxiety	Low	4.52 (6.46)	1.64 (6.89)
	High	-1.38 (8.02)	-4.25 (6.80)

Analysis of Variance

Source	*df*	*MS*	*F*	*p*
Defensiveness	1	8.25	2.61	n.s.
Test anxiety	1	34.78	11.01	$<.01$
Interaction	1	0.00	<1.00	n.s.
Within Cells	66	3.16		

Table 69.

Mean Creativity (in Summed Standard Scores) for Test Anxiety and Defensiveness Subgroups (N=70 boys)

		Defensiveness	
		Low	High
Test Anxiety	Low	1.37 (8.14)	-1.90 (4.13)
	High	2.99 (8.28)	0.45 (6.62)

Analysis of Variance

Source	df	MS	F	p
Defensiveness	1	8.42	2.97	<.09
Test anxiety	1	3.92	1.38	n.s.
Interaction	1	0.13	<1.00	n.s.
Within Cells	66	2.84		

4

Table 70.

Mean Intelligence (in Summed Standard Scores) for Test Anxiety and Defensiveness Subgroups (N=81 girls)

		Defensiveness	
		Low	High
Test Anxiety	Low	0.12 (5.61)	1.22 (7.06)
	High	0.81 (7.47)	-4.29 (8.61)

Analysis of Variance

Source	df	MS	F	p
Defensiveness	1	4.00	1.36	n. s.
Test anxiety	1	5.83	1.98	n. s.
Interaction	1	9.62	3.26	$<.08$
Within Cells	77	2.95		

Table 71.

Mean Creativity (in Summed Standard Scores) for Test Anxiety and Defensiveness Subgroups (N=81 girls)

		Defensiveness	
		Low	High
Test Anxiety	Low	-0.30 (5.83)	-2.71 (8.79)
	High	0.39 (6.46)	2.00 (9.60)

Analysis of Variance

Source	df	MS	F	p
Defensiveness	1	0.16	<1.00	n.s.
Test anxiety	1	7.28	2.13	n.s.
Interaction	1	4.04	1.18	n.s.
Within Cells	77	3.42		

Table 72.

Mean Band-Width Scores for Test Anxiety and Defensiveness Subgroups (N=70 boys)

		Defensiveness	
		Low	High
Test Anxiety	Low	48.50 (7.34)	47.96 (9.88)
	High	44.10 (11.19)	38.21 (11.16)

Analysis of Variance

Source	df	MS	F	p
Defensiveness	1	10.32	1.61	n.s.
Test anxiety	1	50.04	7.83	<.01
Interaction	1	7.12	1.11	n.s.
Within Cells	66	6.39		

Table 73.

Mean Band-Width Scores for Test Anxiety and Defensiveness Subgroups (*N*=81 girls)

		Defensiveness	
		Low	High
Test Anxiety	Low	36.85 (7.96)	41.57 (10.79)
	High	37.46 (12.99)	42.86 (10.18)

Analysis of Variance

Source	*df*	*MS*	*F*	*p*
Defensiveness	1	25.61	3.74	<.06
Test anxiety	1	0.90	<1.00	n.s.
Interaction	1	0.11	<1.00	n.s.
Within Cells	77	6.84		

Table 74.

Mean Number of Low Quality Stories for Test Anxiety and Defensiveness Subgroups (N=70 boys)

		Defensiveness	
		Low	High
Test Anxiety	Low	0.00 (0.00)	0.48 (1.12)
	High	0.10 (0.44)	0.57 (0.94)

Analysis of Variance

Source	df	MS	F	p
Defensiveness	1	0.23	5.69	<.03
Test anxiety	1	0.01	<1.00	n.s.
Interaction	1	0.00	<1.00	n.s.
Within Cells	66	0.04		

Table 75.

Mean Number of Low Quality Stories for Test Anxiety and Defensiveness Subgroups (N=81 girls)

		Defensiveness	
		Low	High
Test Anxiety	Low	0.15 (0.38)	0.36 (0.62)
	High	0.15 (0.46)	0.50 (0.85)

Analysis of Variance

Source	df	MS	F	p
Defensiveness	1	0.08	3.87	<.06
Test anxiety	1	0.01	<1.00	n.s.
Interaction	1	0.01	<1.00	n.s.
Within Cells	77	0.02		

Table 76.

Mean Number of Lows (Atomistic Physical Responses) in Free Descriptions of Stick Figures for Test Anxiety and Defensiveness Subgroups (N=70 boys)

		Defensiveness	
		Low	High
Test Anxiety	Low	0.00 (0.00)	2.96 (6.24)
	High	1.14 (1.80)	1.43 (3.30)

Analysis of Variance

Source	df	MS	F	p
Defensiveness	1	2.63	2.65	n.s.
Test anxiety	1	0.04	<1.00	n.s.
Interaction	1	1.78	1.80	n.s.
Within Cells	66	0.99		

Table 77.

Mean Number of Mediums (Wholistic Physical Responses) in Free Descriptions of Stick Figures for Test Anxiety and Defensiveness Subgroups (N=81 girls)

		Defensiveness	
		Low	High
Test Anxiety	Low	20.08 (7.65)	19.50 (6.14)
	High	22.04 (4.12)	22.43 (4.42)

Analysis of Variance

Source	df	MS	F	p
Defensiveness	1	0.01	<1.00	n.s.
Test anxiety	1	5.98	3.45	$<.07$
Interaction	1	0.23	<1.00	n.s.
Within Cells	77	1.73		

Table 78.

Mean Number of Highs (Affective Responses) in Free Descriptions of Stick Figures for Test Anxiety and Defensiveness Subgroups (N=81 girls)

		Defensiveness	
		Low	High
Test Anxiety	Low	14.08 (7.99)	14.32 (6.97)
	High	11.08 (5.25)	9.93 (4.14)

Analysis of Variance

Source	df	MS	F	p
Defensiveness	1	0.20	<1.00	n.s.
Test anxiety	1	13.66	6.33	<.02
Interaction	1	0.49	<1.00	n.s.
Within Cells	77	2.16		

Table 79.

Mean Number of Correct Abstract Pattern Choices for Test Anxiety and Defensiveness Subgroups (N=70 boys)

		Defensiveness	
		Low	High
Test Anxiety	Low	20.25 (2.45)	19.61 (2.41)
	High	20.38 (1.53)	18.29 (3.00)

Analysis of Variance

Source	df	MS	F	p
Defensiveness	1	1.87	5.62	<.03
Test anxiety	1	0.36	1.07	n.s.
Interaction	1	0.53	1.59	n.s.
Within Cells	66	0.33		

Table 80.

Mean Number of Correct Abstract Pattern Choices for Test Anxiety and Defensiveness Subgroups (N=81 girls)

		Defensiveness	
		Low	High
Test Anxiety	Low	18.77 (3.52)	19.79 (2.08)
	High	19.23 (2.72)	17.36 (3.30)

Analysis of Variance

Source	df	MS	F	p
Defensiveness	1	0.18	<1.00	n.s.
Test anxiety	1	0.97	2.27	n.s.
Interaction	1	2.09	4.89	<.04
Within Cells	77	0.43		

Table 81.

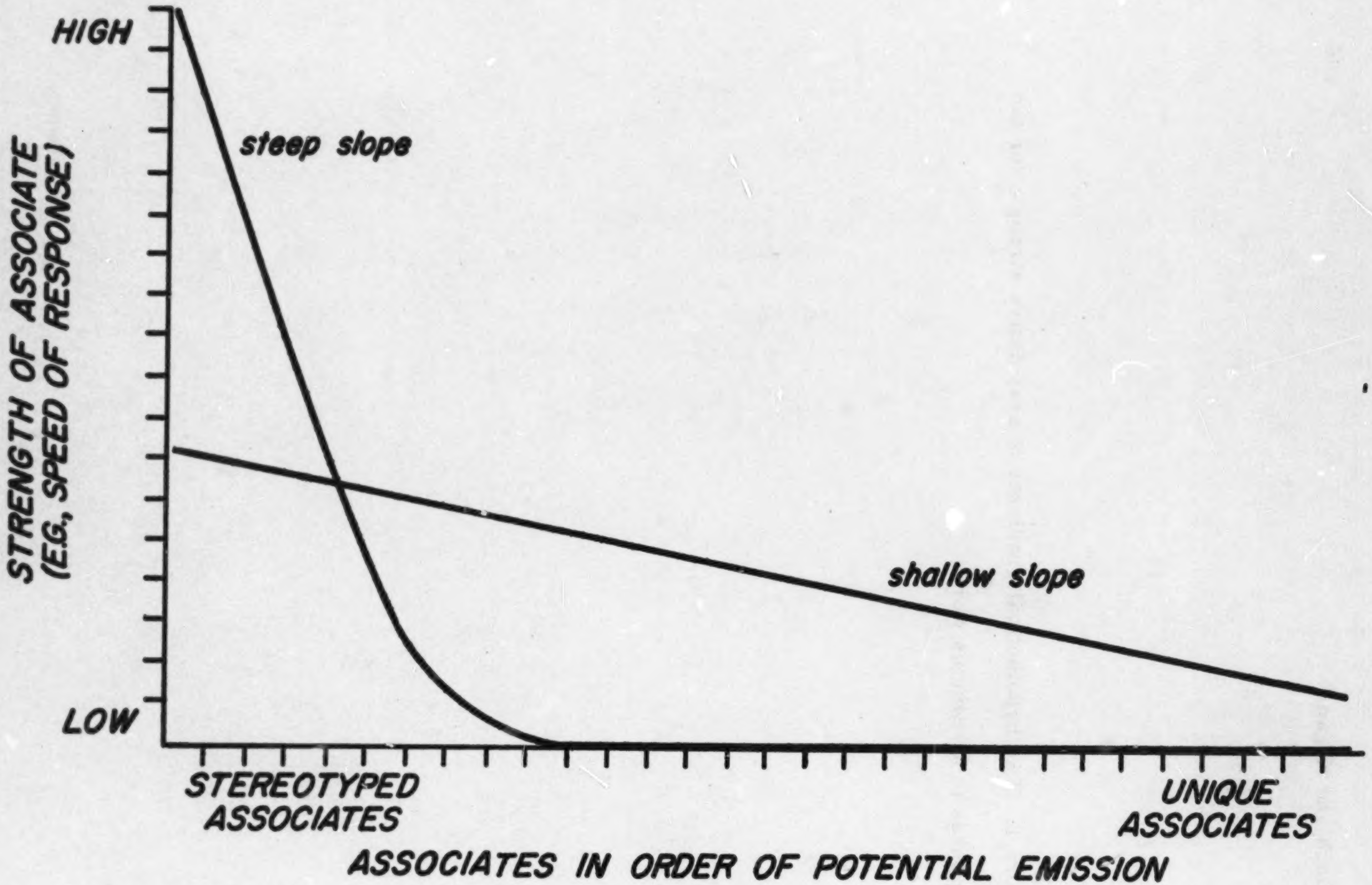
Mean Number of Moderately Appropriate Emotive Attributions to Stick Figures for Test Anxiety and Defensiveness Subgroups (N=70 boys)

		Defensiveness	
		Low	High
Test Anxiety	Low	19.33 (2.61)	18.17 (3.11)
	High	19.52 (2.60)	17.93 (3.08)

Analysis of Variance

Source	df	MS	F	p
Defensiveness	1	1.90	3.73	<.06
Test anxiety	1	0.00	<1.00	n.s.
Interaction	1	0.05	<1.00	n.s.
Within Cells	66	0.51		

Figure 1. Two hypothetical gradients of associative strength for the responses to a stimulus word.


HIGH
LOW
STRENGTH OF ASSOCIATE
(E.G., SPEED OF RESPONSE)
steep slope
shallow slope
STEREOTYPED ASSOCIATES
UNIQUE ASSOCIATES
ASSOCIATES IN ORDER OF POTENTIAL EMISSION

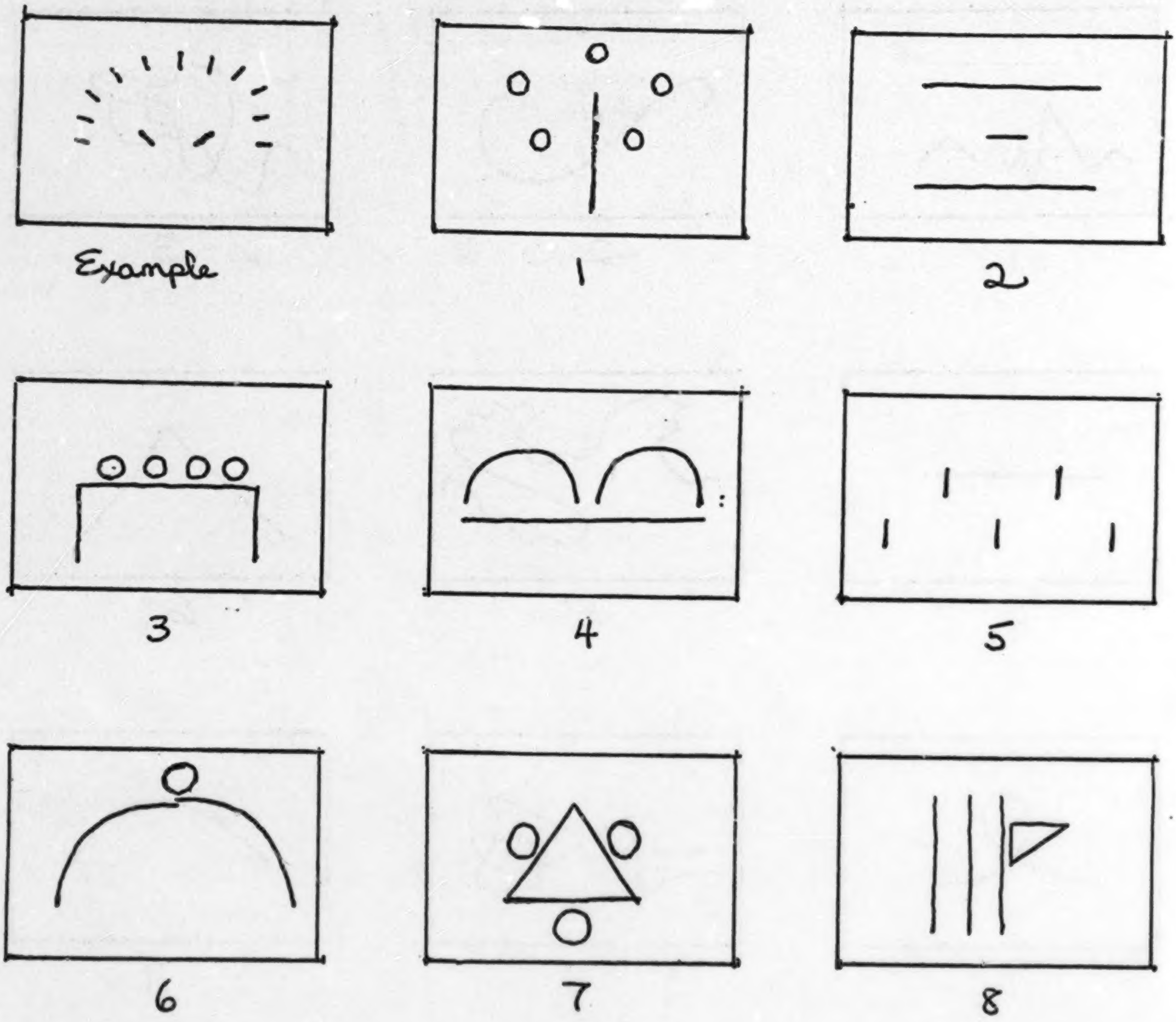

Example
1
2
3
4
5
6
7
8

Figure 2. Stimulus materials for the Pattern Meanings procedure.

(Original cards, 4 in. x 6 in.)

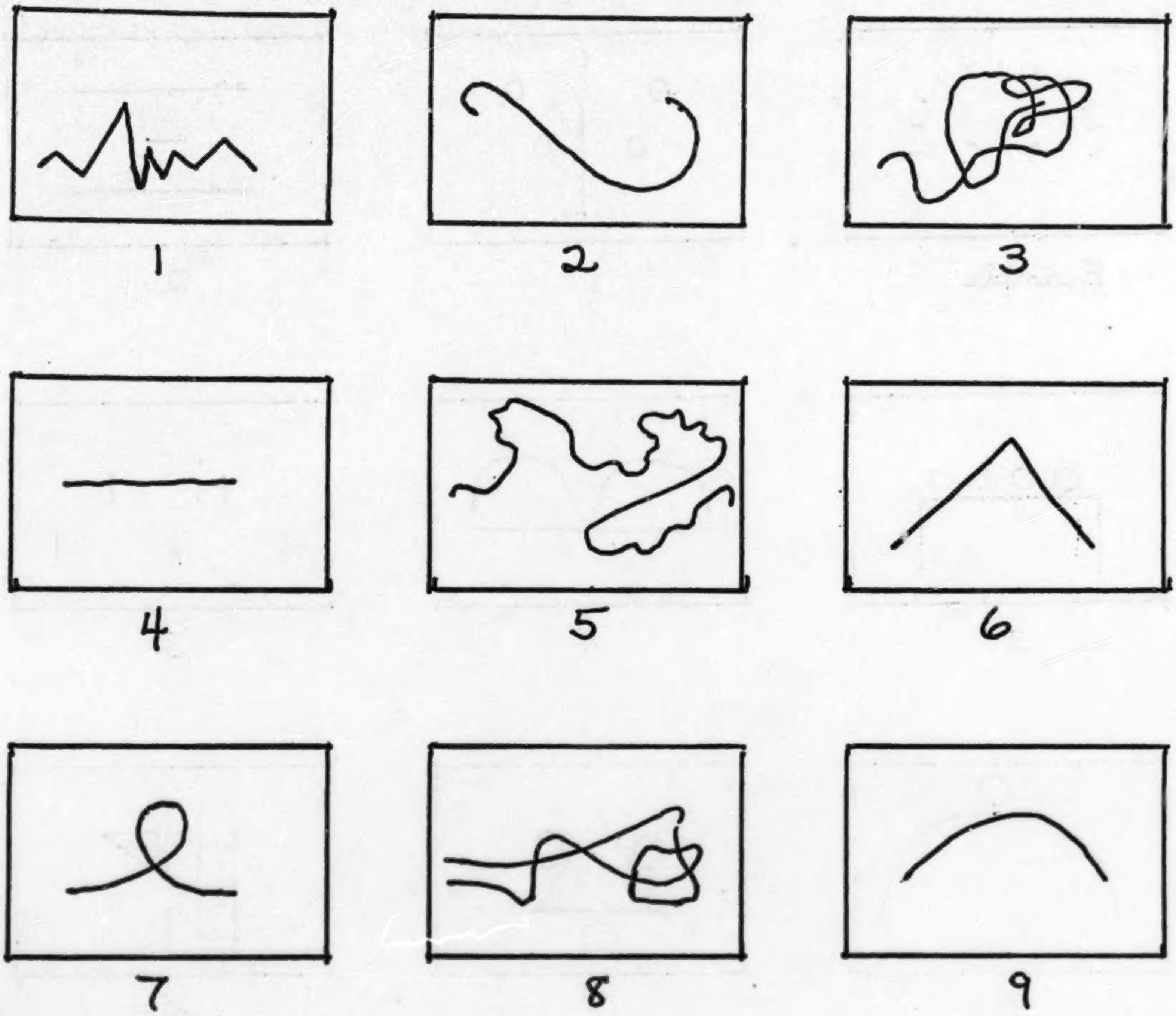


Figure 3. Stimulus materials for the Line Meanings procedure. (Original cards, 4 in. x 6 in.)

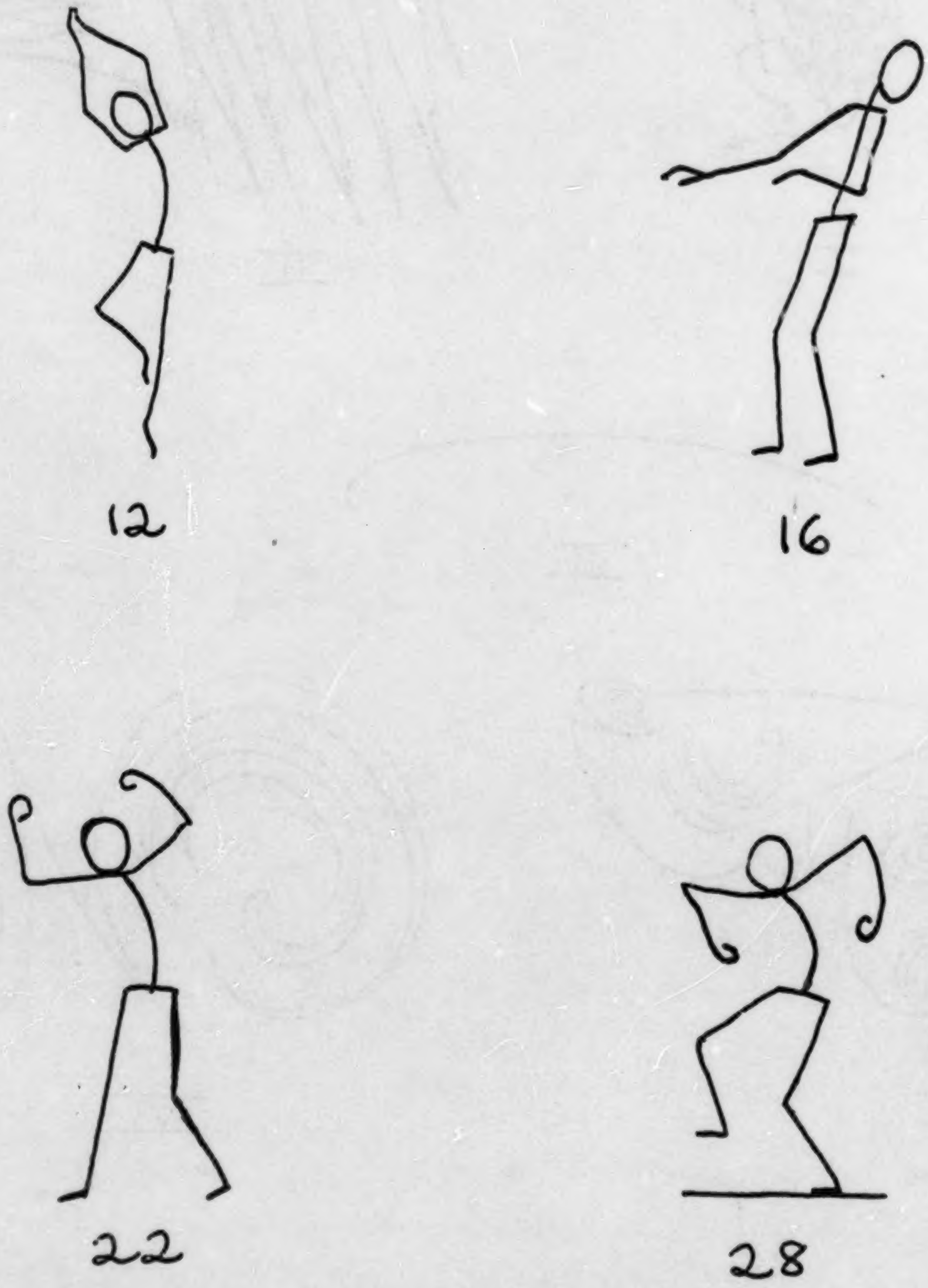


Figure 4. Examples of four of the stick figures.

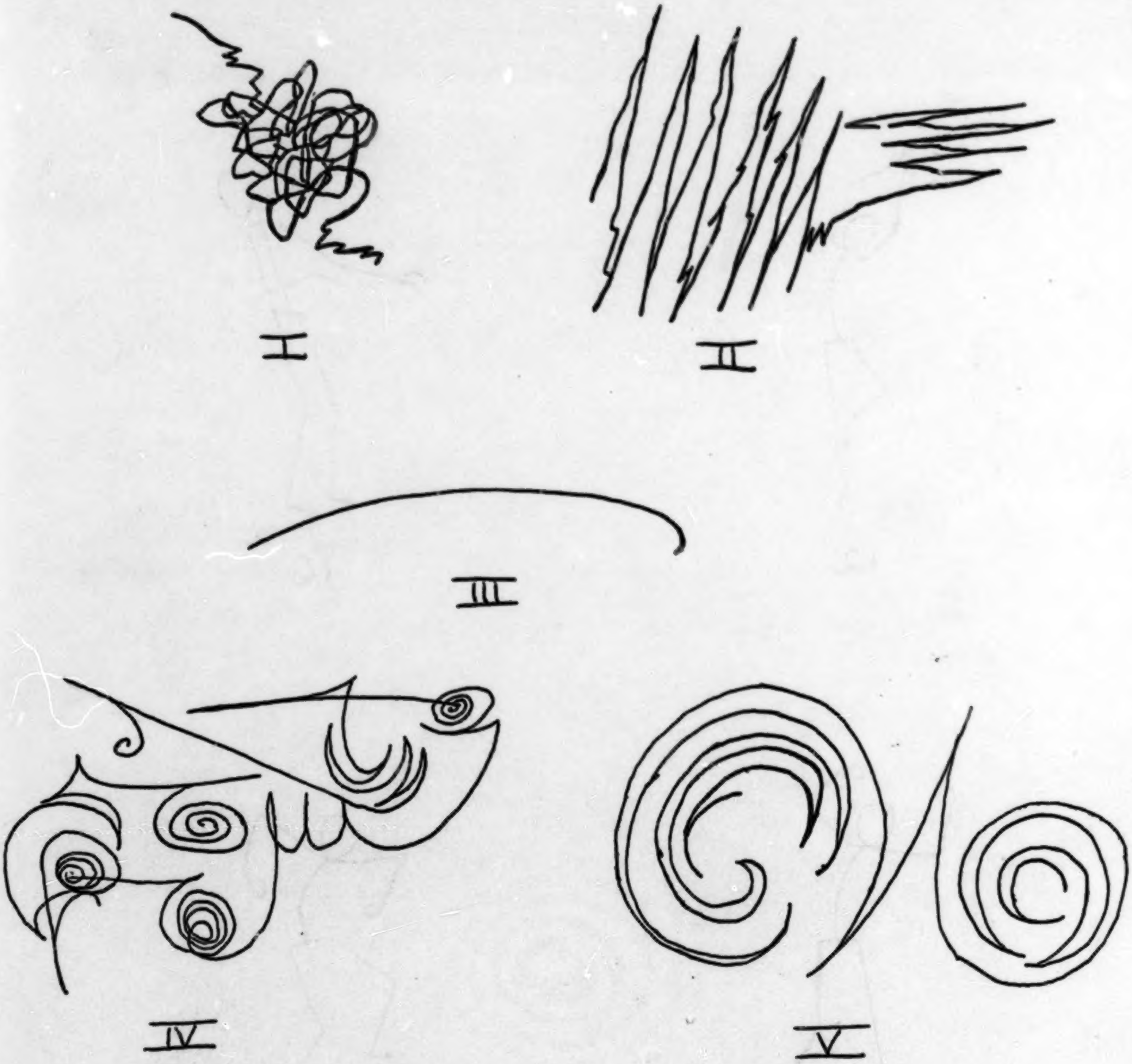


Figure 5. The five abstract patterns used in the Emotive Connotations of Abstract Patterns procedure.